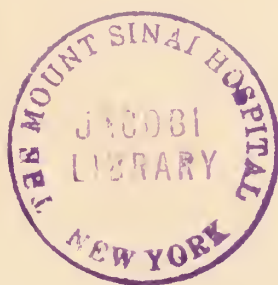


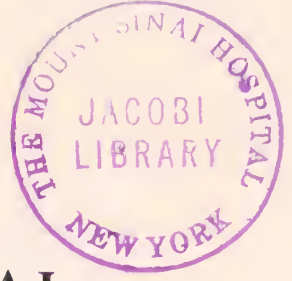


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NEUSTADTER HOME REOPENED

(December 4, 1949)

Address Delivered by Its President, Mrs. WALTER A. HIRSCH

This is indeed a great day for those of us who have worked for many years for convalescent care. It is because of the funds made available to us through the Moses Weinmann Fund and the Neustadter Foundation that we have been able to build the Moses Weinman Memorial Building and to remodel and rehabilitate the old Neustadter Home.

We have been fortunate in having these two generous benefactors. We are also most grateful to other friends, who through their gifts, have enabled us to increase our efficiency.

A special tribute should be given to the building committee, of which Mrs. Edwin C. Vogel is chairman, Mr. James Felt co-chairman, and also to Mrs. Henry Elias, for their selfless devotion to the creation of the new Neustadter.



Aerial view of The Neustadter Home with the Moses Weinman Wing to the left.

We would also like to thank Dr. Pastore, the architects, the builders, our own medical director, Dr. Herman Zazeela, our Superintendent and our nursing staff

as well as the Director and staff of The Mount Sinai Hospital, and also all the others who have cooperated in making today's dedication exercises possible.

We feel that this day marks a milestone, not only in our new physical plant, but in the better care we will be able to give *the patient*. Our first consideration has always been *the patient*. As evidence of this, I would like to quote a few remarks made by the patients in the short time we have been open.

One patient was heard to exclaim "It's a miracle!" Another expressed his feelings in this manner: "To think all these good people give their time and thoughts and do so much for us." Another patient, after being escorted to her room, and glancing around said: "All my life I have been poor. Now for three weeks I can be rich."

It is now my pleasure to introduce the speaker of the occasion. He is our own adviser and consultant, and through the years has shown great community interest in convalescent care. He has so many titles that I could not possibly recite them all. To mention only a few, he is director of clinical research at Mount Sinai Hospital, and president of the Medical Board. He is a past-president of the New York Academy of Medicine. To us, he is "our" Doctor George Baehr.

The Journal of The Mount Sinai Hospital, concerned as it is mainly with the more urgent diagnostic and therapeutic problems in medicine and surgery, is also aware of the growing interest in the almost equally pressing demands for convalescent care. It realizes that the physician and surgeon can no longer hold themselves aloof from the patient during this important phase of recovery. With their assistance and under their guidance, the recuperative, physical and emotional assets of the ailing can be appreciably enhanced, thus leading to a speedier and more satisfactory return to normal.

With this in mind it was thought most appropriate to devote the largest part of this issue of the Journal to problems of convalescence as they are encountered in the several branches of medicine and surgery. Moreover, it offers a welcome opportunity to express the deep appreciation of The Mount Sinai Hospital and its patients for the cooperation that the Neustadter Home has shown and continues to show in aiding the hospital to complete a job well begun.

JOSEPH H. GLOBUS, M.D.,
Editor-in-Chief.

ADDRESS AT THE RE-OPENING OF THE NEUSTADTER HOME DECEMBER 4, 1949

GEORGE BAEHR, M.D.

President of the Medical Board, Mount Sinai Hospital, New York

When the Neustadter Home was established in 1919, the panorama of medicine was quite different from what it is today. During the last half century the average length of life has been prolonged almost twenty years due to advances in the medical sciences and the public health control of communicable diseases.

At the time of the establishment of the Neustadter Home, the wards of our general hospitals were still filled largely with young persons and adults in the early decades of life. The diseases for which most of them entered a hospital were largely those which are today almost completely under control, such as lobar pneumonia, typhoid fever, and other infections. These diseases affected many children and young adults in the prime of life who were previously in excellent physical condition. If they survived the illness, their convalescence merely required good food, fresh air, and a pleasant environment away from their homes.

Today these diseases are rarely seen in our hospitals. The general wards are occupied predominantly by people in the second half of their life span. The degenerative illnesses from which they largely suffer can often be reversed or retarded by medical care in the hospital so that they may be restored to economic usefulness. For many of them the problem of convalescence entails very much more than good food, fresh air, and a pleasant environment. The modern convalescent home, of which Neustadter is the type, is predicated upon an understanding of the true nature of the present-day problems of medical care following recovery from illness, which are now intimately involved with physical and psychological rehabilitation.

The structural accomplishments of the Trustees of the Neustadter Home in the new facilities which they have erected and which we view today characterize the new era in convalescent care. These newer functions of convalescence which are concerned with both the physical and psychological rehabilitation of the sick, in the younger and in older age groups, are designed to make the Home an essential adjunct of the hospital. Referral of patients from the Mount Sinai Hospital to the Neustadter Home is no longer a pleasant convenience for the patient or a thoughtful gesture by the referring physician. With the installation of its new facilities and rehabilitation services, the referral of convalescents to the Home becomes an essential obligation of the Mount Sinai Hospital to many of its patients, whose final cure can be accomplished only at Neustadter.

THE NEUSTADTER HOME
MODERN CONCEPTS OF CONVALESCENT CARE
HERMAN ZAZEELA, M.D.

The "Discharged Hospital Patient" is a term which found its way recently into the medical literature. It is applied to a patient who no longer needs the specialized care of the hospital, but is not as yet fully prepared to integrate his activities with those of his household. Modern society of late has been concerned with the health of the discharged hospital patient. The constant advances made in medical technique have undoubtedly resulted in improved states of health and reduced mortality among hospital patients, and have justified the sharp increase in *per diem* cost. However, there is an appalling gap in our knowledge of the continuity and effectiveness of these benefits after the patient has been discharged from the hospital ward. There is an unfortunate and often an unavoidable tendency to consider a case closed when the patient is discharged from the hospital and the final note signed. Follow-up clinics have come into existence to fill the aforementioned gap and to obtain information about the convalescent progress made by the patients after hospitalization. But here success is only partial as many patients are reluctant to return to a hospital in the mistaken belief that their failure to regain their good health is due to faulty care received at the institution.

Weiskotten (1) and his associates who followed a group of 900 patients for a period of 18 months after their discharge from the medical wards of Syracuse University Hospital found that "The duration of many patients' stay in the hospital could have been shortened and many need not have returned to the hospital if intelligent medical supervision after discharge had been provided."

Somewhat less than a century ago, Florence Nightingale recognized the need for organized convalescent care when she stated, "It is a rule without exception that no patient ought ever to stay a day longer in a hospital than is absolutely necessary for medical or surgical treatment. What then is to be done with those who are not yet fit for work-a-day life? Every hospital should have its convalescent branch." This concept which probably was quite revolutionary when it was first formulated has only recently been accepted as a necessity in this country. Planning in England for convalescent care was already begun in the seventeenth century and institutions were built in the vicinity of Bath for individuals who were seeking mineral water treatments. From this limited beginning progress was very slow until the middle of the nineteenth century. Following the publication of her views and apparently stimulated by Miss Nightingale's forceful personality, there was a marked increase in the construction of convalescent facilities in Great Britain. During this period, the United States lagged far behind in this respect, as is indicated by a comparison of surveys made both in England and this country in 1930. At that time there were in England 431 institutions with approximately 2400 beds for convalescent patients, thus providing about 54 beds per 100,000 population. In this country there were only 179 institutions

with a bed capacity below 9000, providing only about 7.1 beds per 100,000 population.

DEVELOPMENT OF CONVALESCENT CARE

The history of convalescent care in the United States is quite short. In 1801 the New York Hospital made an abortive attempt to provide convalescent care on the hospital grounds but was forced to abandon it as the tall city buildings began to close in. Between 1870 and 1900, according to a survey published in 1945 by Gardiner and Thomas (2), only ten convalescent homes were established in the greater New York area. The first of these was opened in Brooklyn in 1872 and was known as the St. Phebe's Mission and Convalescent Rest. Substantial planning for convalescent care in the United States can be said to have started with the beginning of the twentieth century, since the bulk of convalescent facilities came into existence after 1900. Between 1900 and 1929, thirty-one Homes were added to the group serving New York and six more between 1930 and 1940.

In view of its very short history in this country, it is perhaps not remarkable that there should arise a certain amount of confusion, inequity and even abuse before the principles of convalescent care, as they are understood today, were evolved. Apparently the first efforts in such care would today fall under what is considered "old fashioned country boarding house care: a place in the country where one could sit idly and watch traffic go by between meal times". This was reflected first of all in the architecture of the early institutions. Patients were housed in separate cottages which were utilized mainly for rest and sleep. Facilities for dining and recreation were set up in central buildings which were often a considerable distance from the rest cottages. This arrangement precluded the acceptance of certain types of convalescents such as cardiacs, for example, who were by the nature of their illness, unequal to the task of taking long walks several times a day. Furthermore, under such circumstances, inclement weather was another deterrent factor. Convalescent buildings were often erected several stories high without elevators, limiting the accessibility of the upper floors to some convalescents. It became necessary to close off the upper floors or to provide elevators. Obviously these early institutions were not expected to take care of patients in the early phases of convalescence.

CONVALESCENCE DEFINED

The Conference Group on Convalescent Care, an organization of 29 convalescent homes, defines convalescence as follows: "Convalescence is the period of recovery following acute illness or injury. Modern concepts of the care for convalescent patients emphasize the need for continuity of medical supervision. Convalescence begins early after the acute phase of illness or injury and continues until complete cure or rehabilitation has been attained. The likelihood of important improvement differentiates it from long term illness in which recovery may be retarded or remote. Ambulatory patients, recovering from sub-acute or chronic illness, may require convalescent care. Patients requiring special care prior to operation or between operations are also included."

For convenience, convalescence may be divided into several phases. There is the first or earliest phase which finds the patient still in the hospital. For the patient who, for example, has appendicitis, this phase starts almost immediately after the appendix is removed. Similarly, for the patient with a tumor, convalescence begins soon after the tumor is removed, and for the patient who is suffering from pneumonia or typhoid fever, this phase may commence when the temperature has returned to, and is maintained at a normal level. During the early phase of convalescence the patient is still in need of hospital care for one or more reasons. First, therapeutic measures may be quite complicated and demand specialized skill and equipment. Second, because relapse and complications are more common during this phase, the patient must remain under close observation by both physician and nurse. Third, the onset of this phase, because of its gradual development, may not become apparent until several days or possibly weeks have elapsed.

The second phase of convalescence begins arbitrarily immediately with the discharge of the patient from the hospital—whether to his own home or to an institution which provides convalescent care. It is this phase with which the Neustadter Home is most concerned. Experience has shown that it may be possible to shorten the early or first phase of convalescence by better planning for medical care during the second phase. During this phase medical treatment and observation are still required, but to a considerably less degree. Nutritive requirements are usually great during this phase, and patients must often be provided with special diets and caloric and vitamin supplements. Still more important are the psychologic adjustments provoked by the abrupt change from the sheltered and protected environment of the hospital to the exposure of the economic and sociologic demands of every-day life. In some instances, the disturbances set up by this transition may be more important to the future well being of the patient than the experience during the acute illness.

THE NEED FOR COMPETENT CONVALESCENT CARE

For some time it has been obvious to those who have been interested in the over-all picture of medical care that too often there was considerable neglect of the patients following discharge from the hospital. These were the patients whom Florence Nightingale had aptly described as "not ready for work-a-day life". The balance of medical planning had been weighted too heavily on the care of the patient while he was in the hospital. The advances in the technique of care for the hospitalized patient had indeed been impressive. The surgeons, who only recently rarely entered the thorax except to drain an empyema, were now doing complete pneumonectomies and were carrying their surgical skill to the heart itself. The medical men, who only recently could offer their pneumonia patients only "skillful nursing care and general supportive measures" had passed through the eras of anti-sera and sulphonamides and now were using increasingly powerful antibiotics which has the patients ambulatory within a few days.

Hospital care became increasingly scientific, increasingly effective and also increasingly costly to both rich and poor. Unfortunately this highly technical

and expensive care was often nullified by the abrupt discontinuance of treatment immediately after the final note was affixed to the chart and the patient discharged from the hospital. Due to the difficulties encountered in admission of certain types of patients to independent (non-affiliated) Convalescent Homes, many patients were often forced to shift for themselves at the end of the hospital phase of illness and to find their way back to a balanced well-being as best they could. Furthermore, the conflicts and tensions produced by the sudden transition from a completely protected hospital status to that of a bewildered unsheltered discharged patient who, in addition to the residue of illness, often had to cope with pressing economic and social problems, were potentials for the production of psychosomatic disorders which might over-shadow the original illness.

The rehabilitation programs of the military service and of the veterans administration have demonstrated that planned integrated programs of convalescent care could reduce the period of hospitalization and offset the deconditioning phenomena of bed rest and prevent the harmful psychologic sequelae which result from prolonged hospitalization.

The importance of the problem of convalescent care was revealed in several conferences held recently at the New York Academy of Medicine. In his foreword to the 1939 conference, Dr. Malcolm Goodrich, President of the Academy, said that finally the fact was recognized that "convalescence is a sadly neglected field of medical care" . . . and that "one means by convalescence the more or less gradual return toward normal after a period of physical or mental disability and that no medical history is complete until the story of the convalescent period is complete. A patient may have recovered from illness and still be unprepared to assume routine duties. In considering adequate convalescent care, we must think of the individual and his nutritional and psychiatric and economic status. Convalescent care should be considered as a continuing service in which physician, the hospital, social service and the convalescent home all have a share."

COORDINATION OF HOSPITAL AND CONVALESCENT HOME

In order to be able to provide proper convalescent care for its patients, The Mount Sinai Hospital affiliated itself with the Neustadter Home, somewhat more than ten years ago. During those years, the Home accepted the hospital's patients within the limits of its capacity with a rejection rate well under five per cent of the applicants. Based on the experience accumulated during these years, the directors of the Home were able to plan the rebuilding and expansion of its facilities when the opportunity to do so was provided by the generosity of the Moses Weinman will and funds provided by the Neustadter Foundation. Before describing the new home which has recently reopened, it may be worthwhile to review some of the experiences and benefits that have resulted from the ten years of cooperation between Home and Hospital.

One of the first steps taken after the affiliation was established was the lifting of almost all of the usual restrictive rules and regulations which blocked the admission of the sicker type of patient. This was the most significant and imme-

diate advantage resulting from the affiliation. Neustadter's requirements have been, and still are, that the patient be ambulatory and no longer in need of hospital care. An "ambulatory" patient is one who is capable of performing the major acts of dressing and undressing and able to walk to bathroom and dining room. The few restrictions which were necessary were reduced to a minimum. Thus, patients with infectious or frank tuberculous disease obviously could not be accommodated. However, this restriction did not exclude patients suffering from pleurisy with effusion—provided lung fields were clear and the sputum and the gastric washings were negative. Another necessary restriction was that patients with severe emotional disturbances could not be admitted unless a careful evaluation by a staff psychiatrist excluded antisocial tendencies. The third restriction was for patients with grotesque deformity or habit spasm which might disturb and therefore retard the recovery of other patients.

With these restrictions, the doors of the Home were open to any patient who would benefit from convalescent care offered there. Customary limitations regarding age of patient, degree of blood pressure, size of surgical dressing, or nature of the disease were set aside with but few exceptions. The sole consideration was the patient and his capability of regaining a state of health which would permit him to function with reasonable efficiency at his economic and social level.

The Neustadter Home has been able to practice this unusually liberal admission policy only because The Mount Sinai Hospital stood ready to promptly take back patients who became too ill for the Home to care for. Transfer from the Neustadter Home to The Mount Sinai Hospital was facilitated by a special arrangement whereby the attending physician of the Home was also the admitting physician of The Mount Sinai Hospital insofar as the readmission of convalescent patients was concerned.

At this point it may be of interest to review a survey of the number and types of patients who required return to The Mount Sinai Hospital from the Neustadter Home under these policies of liberal admission. During the year of 1945, 19 patients were returned to The Mount Sinai Hospital, 13 by taxi and 6 by ambulance. In 1946, 31 patients were sent back, 23 by taxi and 8 by ambulance. In 1947, 27 patients were returned, 22 by taxi and 5 by ambulance. For the three years, a total of 77 patients were sent back for readmission to The Mount Sinai Hospital. During these three years, the Neustadter Home provided convalescent care for nearly 2500 patients. It is obvious that the status of the aforementioned 77 patients changed to such a degree during the convalescent period that transfer back to the hospital was most advisable. This is about three per cent and certainly is not excessive when considered in the light of "degree of sickness" of the patients. A comparison of this group of 2500 patients with a similar group of 2500 patients who had not had the benefit of institutional convalescent care would have been of interest. Unfortunately such studies have not been made, but one cannot help but wonder what per cent of hospital referrals would be found in such a control group.

Besides the greater accessibility, the affiliation of The Mount Sinai Hospital

and the Neustadter Home has opened the way for other advantages, such as control over and continuity of medical care throughout the convalescent period. Medical control makes it possible to carry on a particular regime of treatment for a considerable time after the patient has left the hospital. When desired, the chosen regime can be continued until the patient is readmitted for evaluation in the hospital. In many instances, long periods of hospitalization, which are sometimes required to observe the effects of treatment, can be reduced or eliminated. Similarly some patients, who require special pre-operative treatment, can be cared for at the Home, until the time when the patient is ready for the hospital.

Continuity of medical care is considered by most authorities as of the greatest importance in establishing easy transition from the hospital to the convalescent state. The confidence which the patient has built up in the physicians who saw him through the most serious phase of illness is a major factor in promoting smooth convalescence. Continuity of care is emphasized at Neustadter Home whenever possible. The drugs used at the Home are supplied by the Hospital pharmacy and are therefore familiar to the patient. Unless there is a definite contraindication, the initial orders at the Home for a given patient are identical with his orders during the last few days at the hospital. The patient has easy accessibility either by telephone, or visit, if necessary, with the social worker who contacted him at the hospital and is familiar with his problems. The patient is also informed directly or indirectly that consultation with the hospital physician who is best informed regarding his case is easily arranged when desirable. The value of these assurances to a patient who feels "low" physically or mentally and who is fearful of a relapse or a complication cannot be over-emphasized.

SELECTION OF PATIENTS

The selection of patients for convalescence is the responsibility of the physician. He is best qualified to know how much care,—medical, physical, psychological—his patient will need before he is ready to fit into his particular social and economic level. Convalescence must be regarded as a transition period during which the patient, although no longer in the hospital, continues to require adequate medical attention if progress toward recovery is to be smooth and uninterrupted. Every effort should be made by the practicing physician to plan satisfactory care for patients between the time of discharge from the hospital and their resumption of normal activity. Full obligation is otherwise not fulfilled to the patient, hospital or community. To plan successfully, the physician requires considerable information and assistance from the social worker before he can make his recommendations. At the present time, it is not possible to provide planned convalescence for all patients. Therefore, in the selection of patients, it is necessary to weigh carefully the medical, psychological, economic and environmental factors involved in each case. In some, perhaps many, the latter may be more pressing, and since they are in the province of the social worker, her role becomes very important. The ultimate decision regarding convalescence,

however, should be made by the physician when he is in possession of all of the essential factors, both medical and non-medical.

A grave illness often may have a profound effect upon an individual in a manner not directly related to the primary disease. There is first of all the severe nutritive depletion which has been described so well by Dr. Pollock and which requires special care during convalescence. Then there is the psychic trauma induced by separation from family and associates, concern over possible deterioration in finances, and realization of one's destructibility. Modern convalescent care recognizes these accompaniments of serious illness and tries to cope with them partly by providing favorable environmental conditions. In the absence of active psychiatric care (usually not necessary nor available) at the present time, emphasis is placed upon recreational and occupational therapy. At the same time the convalescent institution must provide active medical care for the underlying disease from which the patient is recovering.

THE NEUSTADTER HOME TODAY

Considerable improvement in the physical features of the Neustadter Home has resulted from the use of funds provided by the Moses Weinman will and the Neustadter Foundation. These made possible the reconstruction of the institution into a modern plant for convalescent care. As a result, the existing structure was completely rebuilt with the exception of its exterior walls and cellar. Also, an entirely new building to be known as the Moses Weinman Wing was added. In planning the interior, the comforts, both physical and mental for convalescent patients, were the only considerations.

Accordingly, the size of the individual units was reduced while the number of such units was increased. Instead of many patients living and sleeping in large wards, rooms were planned for single or, at most, double occupancy. No longer would the snoring or restless movement of one or more of the 15 or 20 other occupants of the ward disturb the rest so essential for the recovery of the patient. All the rooms in the new Wing were provided with either private or adjoining baths. In this way, patients who have colostomy openings and who, at least in the early stages, appreciate the private use of a bathroom for prolonged periods, are better provided for and are less disturbing to others. Also, weakened patients are not required to make long trips to a common bathroom during the night in unfamiliar surroundings. These features are essential for mental and physical recovery in many cases. In addition, the rooms are all decorated and furnished in an individual and pleasing manner. Good lighting is provided with conveniently placed outlets and switches. All rooms have large, unobstructed windows. The new Wing, a one and one-half story building with a modern facade of glass and brick, contains 26 rooms on the main floor, 18 of which are for single occupancy and 8 of which are for double occupancy. All of these rooms have either private or adjoining bathrooms. Also located on the main floor is a room for physiotherapy and a recreation room which is large enough to accommodate the entire population of the Home. This room is fitted with a stage, a large fireplace and television outlets. A special feature of this room is the large built-in



Occupational Therapy room.



Main Recreation Room with a view through "Picture Window".

wall cabinet into which all of the furniture of the room can be stacked very easily. The furniture is all light-weight and designed for this purpose. Within a short time the entire floor can be cleared if needed for other types of recreation. This large recreation room is at ground level and opens out upon a flagstone terrace through a large glass rolling door. Additional terraces and walls are found upon the roof of the new Wing. Several wind breaks have been built on the roof for the protection of seated patients.

The original building has been completely remodeled. It now has 23 rooms which can accommodate 33 patients. The remainder of this building is taken up by the medical and administration offices, dining room, recreation rooms and occupational therapy. Considerable space has been devoted to the latter in recognition of the importance of keeping the patient occupied, both physically or mentally. The space devoted to occupational therapy comprises the lower floor of the west wing of the original building. It has been divided into one large and one small room for different types of therapy. The smaller room is equipped for work in carpentry, ceramics, plastics, etc., while the larger room contains equipment for weaving. Both rooms have acoustic type ceilings and are lined with special built-in cabinets in which material and equipment can easily be stored. The library and the hospitality shop are also located in the original building.

THE STAFF OF THE NEUSTADTER HOME

The nursing staff of the Home consists of six full-time and one half-time graduate nurses. In addition, two full-time practical nurses are used. Three graduate nurses are on duty from 8:00 a.m. to 4:00 p.m., when the work load is greatest. One graduate and a practical nurse are on duty from 4:00 p.m. until midnight, and a similar team from midnight until 8:00 a.m. The remaining nursing time is taken up by relief for day and night nurses and aids. The superintendent of the Home, who is also a graduate nurse, actively follows the medical progress of all the patients. All of the nurses are aware of the importance of being on the alert for untoward changes in the condition of patients. When such a change is suspected it is immediately reported to either the Head Nurse or the Superintendent. Both of these are experienced and unusually skillful in evaluating a patient's complaints and findings. If they believe that a change of orders or an examination by a physician is necessary, they notify the attending physician of the Home. He must decide whether the situation requires a special visit to the Home or whether it can be handled by telephone.

Each patient brings with him an abstract of his hospital chart. In many instances the information contained in this abstract will indicate the reason for the changed condition and the method for correcting it. Thus, the importance of having complete medical information available for the treatment of recently discharged hospital patient is obvious. Most of the institutions which have affiliated convalescent homes send the entire hospital chart along with their patients despite the natural reluctance to have charts leaving the parent institution.

The other members of the resident staff are the housekeeper, dietician and

occupational therapist. The dietician is responsible for the special diets. Diet naturally plays an important role in convalescent care. During the past few years, between 30% and 40% of all Neustadter patients received special diets. The bulk of the special diet cases were those recovering from gastro-intestinal disorders. The others were chiefly diabetics whose treatment is largely dietary, and cardiac patients, who required sodium restriction.

The occupational therapist, who also functions as a recreational director, has a particularly difficult job. She must try to keep approximately 60 adult patients of various ages and intelligence interested, occupied and amused for the greater part of a twelve-hour day. Boredom and anxiety often develop in the patients where she is not successful.

THE MEDICAL CARE

The medical care at the Home is planned to be a continuation of the care at the hospital. The prospective patients who have been referred for convalescent care are examined at the hospital just prior to their departure for the Home. This examination is for the purpose of evaluating the medical status and determination of the type of care required at the Home. It is not for the purpose of weeding out unsuitable cases. Those patients whose admissability is considered doubtful are seen on the ward prior to discharge, and a decision regarding convalescence is made at that time. In this way, the disappointment and trauma of a last minute rejection is avoided. At the pre-admission examination, notes are made regarding patients' cardiac status and important data—such as electrocardiographic report, x-rays, abnormal blood chemistry, etc.—are copied from the hospital chart on a white card which accompanies the patient to the Home. At the same time orders for medication, special diet if required, are entered on the same white card. As stated before the admission orders usually approximate the orders of the last few days of hospitalization. The patients are dispatched by taxicab, and the Home is notified by telephone regarding the diagnoses of the patients who are arriving and also of any special diets, conditions, etc. This information is of value for the assignment of rooms—so that sicker patients can be placed closer to supervision, and congenial patients can be placed near each other, etc. At the same time, preparations can be made for any special type of care or treatment if needed.

The patients are visited regularly twice a week at the Home by the attending physician. In the event of serious relapse the physician visits the patient as often as necessary. At one of the regular weekly visits informal rounds are made and every patient is seen at the bedside. At the other weekly visit, all patients who express a desire to see the physician for any reason whatsoever, are seen in the medical office. At each of these visits, patients are examined, surgical wounds are redressed, and medical orders changed if necessary. Progress notes are made from time to time. The patient's attitude toward his illness and readiness to resume normal activities is noted. Almost all of the patients require reassurance regarding their progress, and this is, of course, given during the examination or interview. Each patient is discharged when it is felt that the maximum recovery

has been made, without regard to length of stay. However, through the past ten years, the duration of convalescence for each patient has averaged approximately three weeks every year.

Some desirable, although unusual features in the field of convalescent care were introduced through the renovation of the Neustadter Home. Innovations are not new, for the Neustadter Home, for it has always been willing to experiment with new procedures and techniques whenever it was reasonable to believe that the guests would benefit by it. Some of the procedures in which Neustadter Home pioneered, such as the liberal admission policy, have now become accepted methods of convalescent care.

The focal point of the planning and the reconstruction has been the welfare of the patient, using welfare in its broadest sense. Neustadter Home is designed to provide maximum physical relaxation and mental reassurance, in addition to required medical care. Experience has shown that the factors of relaxation and assurance are powerful aids in promoting more rapid and orderly recovery from illness.

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A NOTE REGARDING THE ROLE OF THE SOCIAL WORKER AS THE INTERMEDIARY BETWEEN THE HOSPITAL AND THE CONVALESCENT HOME

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Convalescent care is part of the total medical service given to patients, and it is an important step in their rehabilitation. Few patients are physically and emotionally fit to return to normal activities immediately after leaving the hospital, and since early ambulation has shortened the patients' stay in the hospital, a period of convalescent care has become even more essential.

It has always been a function of the medical social worker to serve as the connecting link between hospital and convalescent facilities since she is familiar with the various types of convalescent homes which are most suitable to the patient. She acquaints the doctor with the patient's social and economic situation and together they make plans for the patient's post-hospital needs. The planning of convalescent care should begin early enough to ensure proper arrangements, and presupposes the active participation of the patient and his family and the recognition by doctor and social worker of the patient's own desires.

The majority of our patients who go to convalescent homes are sent to The Neustadter Home. However, in the individualization of the patient, we use other convalescent facilities or make other plans. It is not always feasible for a given patient to go to a convalescent home because of some personal or other reasons. In such a case, the patient's own home, even if not ideal, might be more favorable for convalescence. In some instances, it might be necessary to provide a homemaker or housekeeper, obtain a special food allowance, or instruct the patient regarding adjustments at home.

When the recommendation to go to a convalescent home is accepted, the patient is fully familiarized with policies of the home, particularly in reference to the continuity of medical care, rest periods, visiting hours, and clothing requirements. In regard to the latter, the patient may need assistance from the Social Service Department in the form of some needed but missing articles. The charges are also discussed and the amount is agreed upon if the patient is able to pay. A vacancy is then obtained through the Administrative Assistant of the Social Service Department, who is in charge of all of the details connected with convalescent care.

More and more patients leave directly from the hospital and for those going to The Neustadter Home a conveyance is provided. Every effort is made to transport the patients with as little exertion to them as possible. For various reasons some patients may have to go home for a few days before taking residence at the convalescent home. In such instances, the patient has to return to the hospital, be re-checked by the Neustadter examining physician, and leave directly from the Social Service office.

While at the convalescent home, patients may be fearful and anxious about their families or jobs. Consequently they may wish to shorten their stay at the home to the detriment of their physical condition and against the advice of the doctor. Other patients are apprehensive about returning to their homes and wish to prolong their stay because of the problems which they have to face. In such situations, the social worker is ready with her assistance. The Neustadter staff is in daily touch with the staff of the Social Service Department to acquaint it with any pertinent information regarding the patient's progress. If a telephone interview with the patient is not sufficient, the worker makes a personal visit to The Neustadter Home or interviews the patient's family at the hospital.

The Board of The Neustadter Home has been so conscious of the social and emotional needs of the patients that it has recently authorized the appointment of a medical social worker who will work in close co-operation with the hospital staff. This should further the patient's psycho-social adjustment and vocational reorientation which are all important in providing a total medical service.

PSYCHOSOMATIC ASPECTS OF CONVALESCENCE

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With the subsidence of acute illness and the approach of convalescence, medical interest often tends to lag and, in some instances, may abruptly terminate. When the patient no longer offers either a diagnostic or therapeutic challenge, the physician is inclined to shift his attention to more pressing problems. It is at this time that interviews may become brief, examinations cursory, advice hasty and stereotyped and, in large measure, the patient is left to his own devices. The so-called "normal" convalescent is rarely critical of his physician's diminishing interest but rather welcomes the relaxed supervision and consequent freedom from examinations and procedures which may have become increasingly annoying and even humiliating. He will now tend to express, with varying degrees of emotion, his gratitude to doctor and nurse for their aid in his recovery.

With the return of a measure of freedom and independence, and the prospect of progressive restoration of strength and function, the patient soon becomes preoccupied with taking up the threads of interrupted activities in his home, his associations and his work. The well integrated individual meets the transition from sickness to full return to activity with little psychic trauma. A measure of impatience with his enforced inactivity and physical limitations is perhaps compensated by his "privileged" position in his family and community and the prestige gained by his happy recovery from the mysterious vagaries of disease. The solicitude, devotion and consideration he receives from his family and friends tend soon to restore his self-confidence and he is wont to accept the privileges and immunities of convalescence with scarcely concealed enjoyment. His unflinching fortitude in the face of staggering odds and lurid recitals of his hospital experiences may be the bases for a prolonged, if somewhat colored, conversation piece. Even a warped ego may derive a measure of sustenance from the benevolent attitude toward convalescents that our culture provides.

After a variable period, largely dependent upon the severity and duration of the illness and possible residual disability, the average convalescent tires of his favored role, if his family has not anticipated him. The return to full scale activity, both in his work and diversions, soon obscures both the illness and its possible implications.

The foregoing description is, perhaps, an over-simplified picture of the behavior pattern of the normal convalescent. Let us now turn to that fairly numerous group whose motivations, either conscious or unconscious, may seriously retard recovery and, in some instances, perpetuate invalidism despite the disappearance of all clinical evidence of somatic disease. With the termination of illness they face the blunt realization that their dependence is at an end and that they must soon meet the baffling and bewildering threats of a competitive, and often unsympathetic, environment. For them, the seductive protection of the hospital and sickroom, the indulgent and kindly attitude of the doctor and nurse are contrasted with the insecurity and monotony of their customary activities. The ill-

ness or injury may, in fact, establish a situation suiting the inherent infantile needs of the patient. The doctor's casual manner and growing disinterest are foreboding signs of rejection. For an all too brief period, he had served to calm their fears, minister to their wants and provide them with the security and dependence which were forbidden them in their own *milieu*. For those to whom a "flight into disease" represents a fortuitous, if temporary, solution of their conflicts and fears, the hazards of convalescence may be overwhelming. Examples of this type abound in the experience of most physicians. The overburdened housewife with little hope for escape from the mounting responsibilities of a large, and often inconsiderate family, does not require the aid of "unconscious motivations" to find a measure of surcease and respite in a prolonged convalescence. Similarly, the woman who has been "poorly" for an indefinite number of years following a trivial ailment or injury, has thus succeeded in attaining a privileged status, with its attendant immunities. The head of a family, no longer able to cope with successive reversals on equal, or unequal, terms will often seek, and sometimes find, spiritual and emotional asylum in the perpetuation of his symptoms through an interminable convalescence. These are the people who continue to seek the shelter of the hospital under the mask of disease. In the presence of intolerable situational factors, continued invalidism spells a specific secondary gain. To these psychoneurotically disabled individuals, injury or disease are closely integrated with their fears and frustrations, either at the reality level or at the unconscious, or fantasy level.

Kubie (1), in a discussion of the role of unconscious motivations in the process of recovery states that "everyone carries forward from infancy and early childhood a residue of undigested experiences, of misconceptions, misunderstandings and misapprehensions about himself, his body and the world. Out of these undigested residues grow unconscious fears, guilt feelings, resentments and longings. Inevitably, these underground streams are tapped by any profoundly moving experience". It is these emotions, residing largely at the unconscious level, which may account for the bizarre and unpredictable attitudes of the adult convalescent.

When the relatively smooth course of existence is disrupted by a severe disabling illness, disturbing unconscious forces may be unleashed and their effects will depend upon such imponderable factors as the intensity of the motivations, the measure of the patient's defenses and the degree of his integration. The meaning of disease varies widely with different individuals; for some it will activate a deep-seated neurotic, or even psychotic, trend and for others it may represent a happy solution to an intolerable neurotic situation. A reciprocal relationship between an agitated depression and somatic illness is often observed; the patient accepts disease with stoical calm but reverts to a disturbed state when his ailment terminates. With the removal of illness as a reality, deeper motivations and goals, with potentially serious implications, can be set in motion. In certain psychosomatic entities such as asthma, ulcerative colitis or neurodermatitis, the relief of symptoms will frequently precipitate a profound depression or paranoid state. Unless careful psychiatric supervision is maintained, relief from psychosomatic symptoms may prove catastrophic. The patient who offers a deceptive facade of

exemplary conduct and cooperation presents a not uncommon hazard during convalescence, because his failure to secure an adequate outlet for his unexpressed hostility may ultimately appear in the form of a serious psychosomatic symptom or disease. Medical and nursing staffs must be constantly alert in identifying this personality pattern so that prompt treatment may be instituted.

Ruesch (2), and his associates, in a psychiatric appraisal of 187 individuals with delayed recovery, conclude that the pre-morbid personality dominates the choice and course of the disease. Their study of the group characteristics, drawn very largely from the lower middle class, reveals the peak age concentration in the mid-thirties, a moderate preponderance of females who incidentally have a high divorce rate, with average education but slightly above average intelligence. A survey of their habits discloses very little abuse of alcohol or tobacco, with an unusually high percentage of total alcoholic abstainers (44 per cent). This finding may evoke speculation that indulgence in alcohol may possibly serve as a substitute gratification for a delayed convalescence. Using various projective techniques, Ruesch's group found a scoring pattern suggesting hypochondriacal, hysterical or depressive trends with some instances of the pre-psychotic type. In more than 90 per cent of the cases of prolonged recovery there were three well defined syndromes, viz. a) pain in a variety of locations, b) gastrointestinal symptoms and c) anxiety features. The case histories disclose a preponderance of patients with persistent physical symptoms without objective findings. Analysis of the family settings reveal, in most cases, considerable family discord and sexually frigid or maladjusted mothers, as well as a lack of love and security in childhood.

The traumatic implications of disease, operation or injury are largely conditioned by the significance attached to the part involved. As formulated by Dunbar (3) the accident-prone individual will accept a fractured leg with docile equanimity, but will react to a minor illness with profound anxiety. Some individuals will make a satisfactory adjustment to the loss of a limb, but will be unable to face the amputation of a finger. To the narcissistic or exhibitionistic person, the implications of a minor facial injury may far exceed those of grave disease. The explanation of such diverse, and apparently irrational, reactions to injury and disease must be sought in the patient's unconscious motivations. Negligence of these motivations during illness or injury will often lead to a fixation of symptoms and permanent invalidism.

CHRONIC DISEASE

The medical aim in acute disease is the attainment of the physiologic and psychologic equilibrium that prevailed before the onset of the illness. In chronic disease, however, the problem of management is complicated by the persistence of varying degrees of disability and symptoms which may even extend throughout the patient's life. In a not inconsiderable number, however, the degree of invalidism bears little, if any, relationship to the anatomical defect or physiologic limitations, but is rather determined by the symbolic meaning of the disability in relation to the individual's unconscious motivations and goals.

It is in chronic disease that we are so frequently confronted with striking dis-

parities between physical signs and symptoms. The more common type of behavior, which we have all witnessed, is that of unimpaired morale and philosophic acceptance in the face of disfiguring deformities and painful disabilities. Examples of such behavior are commonly found among the victims of paraplegia and poliomyelitis who are often condemned to a wheelchair existence. Similarly, the average victim of blindness and deafness makes an amazing adjustment to the realities of his situation with, in many instances, scarcely diminished usefulness. Such attitudes are to be contrasted with those whose symptoms and complaints are completely disproportionate to the physical findings and actual degree of disability. A trivial infirmity or symptom may induce a state of psychological invalidism and even total demoralization. The degree of disability is often determined by the patient's psychosociologic status as well as the meaning of his symptoms. Although conscious motivations may play an insignificant role in his complaints, and overt malingering may be dismissed as a significant factor, he is conspicuous among insurance litigants either for accident compensation or disability benefits. As in convalescence from acute illness, his recovery may be indefinitely postponed when he is faced with the prospect of returning to a responsible and competitive role. His preoccupation with a minor symptom or defect will thus serve as a convenient escape from a distasteful situation. Similarly, his needs for dependence and protection are answered by the increased facilities provided for the care of the chronically ill through civilian agencies and Veterans' Administrations. Chronic disease, with its persistent symptoms, must therefore also be deemed a psychosomatic problem in which the personality pattern of the individual which pre-existed his ailment, largely determines his capacity to achieve an adjustment to his physical limitations and thus resume a measure of productiveness.

PSYCHOTHERAPY

Success in the management of psychological problems during convalescence will depend largely upon the speed with which the disturbance is recognized and the despatch with which psychotherapy is instituted. Signs of abnormal behavior, or a persistence of similar trends noted during the acute illness, require prompt psychiatric attention.

The nurse's observations and notes on the patient's behavior on the ward may be a source of valuable material. The patient who, for a variety of reasons, withholds his complaints from his physician, may freely ventilate his troubles to the nurses and other attendants. Additional information as to possible causal factors in the familial, marital and economic fields may be obtained through the social service caseworker. Similarly, the observant vocational or occupational therapist may be able to furnish helpful data.

The psychiatric division at the Mount Sinai Hospital, through a system of liaison psychiatrists who are assigned to the traditional hospital services, has attempted more adequately to meet the emotional disturbances provoked by either illness or convalescence. In addition to routine psychiatric consultations, the psychiatrists attend all major rounds, discuss joint problems with the attend-

ing staff and actively direct, through lectures and seminars, an orientation and educational program on the psychologic aspects of disease.

The initial psychiatric interview will usually determine whether psychotherapy is to be chiefly at a superficial or supportive level with emphasis on sympathy, reassurance, explanation and interpretation, or whether the deeper structure of the personality is to be probed. In the former approach, the therapist's skill in getting the patient to distinguish his personality problem from his concept of his disease, will, in many instances, effect rapid improvement. As soon as he recognizes that his physical symptoms are provoked, or at least influenced, by his emotional state, the symptoms lose their meaning. Thus "psychological advice" as the sole form of psychotherapy, may be sufficient to support the patient through the emotional hazards of convalescence. As in most psychotherapeutic procedures, the rate of recovery is, to a considerable degree, determined by the therapist's personality and his ability to effect a satisfactory transference. Not the least of the therapist's functions is to help patients to make satisfactory adjustments to a permanent colostomy or to a prosthesis.

Should the therapist, after careful evaluation, decide that the superficial approach is inadequate, provision for more intensive study is made. The so-called "short method of psychotherapy" may be started with the patient still on his parent service or he may be referred to the psychiatric clinic. When his financial status permits, he is referred to a private therapist. In some instances, where the need for treatment is deemed urgent, the patient is admitted directly to the psychiatric division. The functioning of this unit has been described elsewhere (4-5). It is staffed by both psychiatrists and internists and is primarily geared to the investigation and treatment of psychosomatic disease. Projective techniques such as the Rorschach, the Bellevue-Wechsler tests, etc., are routinely employed by the attending psychologist and his staff. In the relatively few instances where short psychotherapeutic procedures are unavailing, deep psychoanalysis is recommended.

DISCUSSION

The satisfactory management of convalescence, perhaps in even greater degree than in acute illness, depends on the understanding of the total personality rather than of its component parts. Disregard of the psychiatric aspects at this stage may severely delay recovery and, under certain circumstances, lead to permanent psychologic invalidism.

Streiker states that "it is not an overstatement to say that fully 50 per cent of the problems of the acute stages of illness and 75 per cent of the difficulties of convalescence have their primary origin not in the body but in the mind of the patient". Dunbar (3) points out that we know very little about the hazards of convalescence in comparison with our knowledge of the problems of acute illness. As has been often remarked, the only new feature about psychosomatics is the name, as the psychosomatic approach long antedated the present era. The time-honored injunction to "treat the patient and not the disease" was gradually obscured by the rapid growth of medical knowledge and the rise of specialization.

With the evolution of modern psychiatry, however, we are again witnessing ever widening acceptance of the 'bodymind' concept in the management of disease. The profound psychologic implications of disability and illness can no longer be ignored. Conversely, we have observed lively interest in the effects of severe emotional disturbances on the genesis of certain somatic syndromes.

A comprehensive approach to convalescence and rehabilitation must of necessity stem from a similar enlightened attitude during the acute illness. The varied and bizarre individual responses to disease are accentuated, rather than dispelled during convalescence. Some will react to illness with dread and anxiety, some will find in it a happy release from burdens and responsibilities, others will deem it an insult and still others will interpret it as a form of retaliation for their sins, real or imagined.

When recovery looms, these divergent attitudes may recede before the impact of reality and the drive to resume the pre-illness role. Many however will be loathe to relinquish the attitudes engendered by their illness. Having tasted the pleasures and coziness of the passive dependent relationship they are ill-disposed to resume a precarious role in a coldly competitive environment. For those obsessed with guilt feelings, who find in illness a welcome and satisfactory means of punishment, convalescence may precipitate a panic state when means of expiation are no longer available.

These examples serve to emphasize the vital need for understanding and supportive supervision extending from the acute phase of illness deep into the period of convalescence. Any interruption in the continuity of therapy and care, may prove disastrous.

CONCLUSION

The psychogenesis of the unconscious wish of many patients to remain ill is analyzed. Physicians should be constantly alert to the signs of this trend as their early recognition and treatment may prevent a state of permanent semi-invalidism. During illness, the patient's heightened suggestibility makes him acutely responsive to his doctor's interest and kindness and may induce a state of infantile dependence. Measures to combat such regressive behavior include the encouragement of independence and self-reliance, early ambulation and the rapid, if circumspect, reduction in restrictive activities.

The patient should be taught to distinguish between his personality or situational problems and his concept of his disease. At the deeper level, intensive psychotherapy should often be employed so that the meaning of the symptom or disease may be accurately interpreted. As the motivations for recovery, persistent illness, or even death reside in the patient's psyche, this area can no longer be treated as a *terra incognita*. Effective management of the emotional hazards of convalescence will be measured by the degree to which we successfully invoke the techniques and disciplines of modern psychiatry.

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THE NUTRITIONAL REQUIREMENTS IN CONVALESCENCE*

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There is a drama in the acute episode of illness, not only for the afflicted but also for the physician. The tension of the situation crowded with critical moments, and quick demanding decisions, and emergency measures has naturally overshadowed all else. But when the acute situation has passed, the physician or the surgeon has a tendency to relax and sit back: convalescence begins and all that is offered now is advice to go away, take a sea voyage, relax, eat a good diet and when "fit as a fiddle" get back to work. This may be suitable to the more privileged patient who is economically in a position to take more time in order to regain his normal efficiency under poorly devised convalescent care. The working man, or one who and whose family are dependent upon his ability to restore his earning capacity, cannot afford the luxury of such trial and error methods of convalescence. His strength must be regained as rapidly as possible so that he will be able to reestablish himself economically.

Here it is necessary to realize that convalescence and achievement of speedy maintenance of regained strength depend largely upon the adequacy of the nutritional intake, and upon the recognition of the importance of the proteins in balanced metabolic functions. As long ago as sixty years Friedrich Mueller, the German clinician, recognized that patients with typhoid fever lost comparatively large quantities of nitrogen in the urine. DuBois and his associates, at the Russell Sage Institute of Pathology, during a period of seven years, from 1915 to 1922, reinvestigated this subject with great thoroughness. They demonstrated by carefully planned experiments that patients with typhoid fever and other acute infectious diseases lost alarmingly large amounts of nitrogen in spite of what was thought to be an adequate intake of nutritional substances.

Convalescence is not, what is commonly considered, the termination of the illness, but actually begins during the first day of the acute illness or injury. Thus, adequate nutrition must be instituted immediately, whether the patients are surgical or medical, whether the condition is acute or chronic, whether the illness is recurrent or in a protracted phase as in tuberculosis and cardiac ailments. In many instances the nutritional status of the patient is subordinated to the treatment of the specific disease and much attention is paid to probable medical and surgical complications. The patient may be denied adequate nutrients sufficient to prevent the depletion of the food storage leading to malnutrition. The onset of the latter, in these patients, is insidious, devoid of dramatic features. Sometimes weeks or months may elapse before objective evidence of this nutritional disturbance becomes apparent. Long before the diagnosis of the specific nutritional deficiency can be made on the basis of clinical evidence the patient may become a poor surgical risk, predisposed to complications, infections and unable to tolerate additional depletion of energy. Surgeons have long been accus-

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tomed to attribute most postoperative weakness to the operative procedures or the injury not realizing that much of it may be due to starvation, particularly to deprivation of protein. On the wards of any hospital there are encountered many instances of hypoproteinemia, with or without nutritional edema. Indeed, systemic edema which is not due to disease of the heart, liver or kidneys is usually nutritional. Starvation results in death whether the starvation is induced by famine conditions or by medical incompetency. The depletion of the body and the plasma protein results in asthenia, lack of endurance and loss of weight. If such a condition remains uncorrected then a new set of clinical manifestations may emerge including the edema, lowered resistance to infection and retarded wound healing. The recognition of these nutritional disturbances during acute disease was well known but not fully appreciated.

During the recent war, because of the necessity for the speedy return to active duty of the sick or wounded soldier, interest was renewed in this subject. It became apparent that one of the main factors which appeared to retard the convalescence was unsatisfactory nutrition. More recent studies have shown that the incidence and duration of this catabolic destruction of the protein is not altogether predictable. Certainly in different disease conditions the reactions were somewhat different and in different phases of the same disease the reactions varied. Brown has suggested that the terms "catabolic phase" be used for that period of the condition in which there is an excessive destruction of nitrogen and "anabolic phase" for that period characterized by the retention of nitrogen. The pre-existing state of nutrition in a patient plays an important role in determining the extent of his catabolic phase. Well nourished patients will have a much larger catabolic response than chronically ill patients who have been nutritionally depleted before the acute incident. Further difficulties in assaying the importance of these various phases occur when there is mechanical loss of protein such as the exudative lesions of burns and the loss of blood in hemorrhage.

In addition to these physiological factors associated with the loss of protein from the body there are the dietary factors. Many of the so-called specific therapeutic diets which are prescribed by the physician in the belief that they would aid in correcting the presenting symptomatology and even restore normal function may, in themselves, provoke these nutritional deficits. A recent study of hospital dietaries in greater New York indicates that most of them are inadequate when compared to even the normal nutritional requirements as set up by the National Research Council accepted standards of food intake. When one superimposes upon the normal requirements the added requirements of the catabolic phase of the disease or injury then obviously the hospital dietary is inadequate for the purposes of maintaining good nutrition during the acute illness and certainly inadequate for the nutritive rehabilitation required during convalescence. The usual postoperative regimes are hopelessly inadequate from this point of view. The regular diet of the hospital contains on an average 70 grams of protein each day. That is, the patient is offered 70 grams of protein. The acceptance of the patient however, is quite another matter. The so-called high protein diet in most hospitals contains a maximum of 120 grams of protein in the 24 hour

allowance. In view of the loss of nitrogen, in the diseased and the injured patient, it is understandable why the regular diet is hardly adequate and the high protein diet, in many cases, is insufficient. The standard postoperative regimes are even more deficient than the regular diets. The peptic ulcer regimes, the soft diets, bland diets, many of the diabetic diets are all deserving of a good deal of criticism because of their imbalance, particularly their caloric and protein inadequacies.

Protein is an essential constituent of the tissues of the body which cannot be replaced by any other type of food stuff. Its loss is deleterious and, of course, must be prevented. At times it is impossible or impracticable to prevent the nitrogen loss during acute episodes. This, however, should be reduced to a minimum. In chronic and debilitating conditions the powers of the body to anabolize protein, however, seems to be intact. It is essential that the nutritive rehabilitation of these patients be as rapid and as early as possible.

As many believe the catabolic phase is certainly self-limited though of unknown duration and it is almost invariably followed by an anabolic phase. The latter phase should be aided by the administration of a generous diet even before the catabolic phase has been completed. It is an accepted maxim of nutritional therapy that good food by mouth is the most effective way to administer protein. The use of protein hydrolysates intravenously or by mouth has become a medical fashion. The advocates of this form of therapy have demonstrated that nitrogen equilibrium can be maintained and that protein requirements of normal animals and humans can be satisfied by these injectable hydrolysates or mixtures of amino acids. They are, however, often quite toxic, provoke nausea, vomiting, and febrile reactions, side effects which are not at all desirable in the debilitated or acutely ill patient. Furthermore, the importance of the caloric intake in relationship to the sparing of the protein or the prevention of some of the protein loss must also be reemphasized.

The caloric intake possible by intravenous administration is, at present, distinctly limited. If one were to take as a figure two thousand calories for the requirement of the average patient this would mean the administration of five hundred grams of glucose or ten liters of a five per cent solution. The injection would have to be given slowly over a long period of time to prevent provoking glycosurias. Such volumes of water for ordinary maintenance are indeed excessive and may be deleterious. Increasing the concentration of the glucose merely increases the danger of phlebitis. Certainly no one would keep a patient on parenteral feeding any longer than was absolutely necessary. During certain acute episodes when the use of the gastrointestinal tract is not available for the nutrition of the patient then, of course, parenteral routes remain open but here a compromise must be made with the full nutritional needs. The intravenous administration of one hundred grams of glucose daily during the period of time in which the patient is unable to take anything by mouth is sufficient to achieve a definite and often pronounced clinical benefit.

When the patient is able to eat and take food by mouth one must recognize the anorexia and the inability or lack of desire of the patient to consume high caloric, high protein diet. The chronically depleted patient, to ingest the amount

of protein required, by means of natural foods, has almost insurmountable difficulties. The sight of a three pound pot roast to a patient suffering from the usual postoperative reaction would be sufficient to remove any vestige of appetite, not to mention the mechanical difficulties involved in cutting, chewing and digesting this quantity of food.

The proper choice of foods and good nursing care are most important in this phase of the program. When the convalescent patient is able to take fluids freely by mouth then it is necessary to substitute high nutrient fluids for the usual non-nutrient fluids. Water, while a necessary item, to the patient, contains no nutrition. Tea, broth and other non-caloric fluids serve only to satisfy the small appetite the patient has without supplying any of the essential nutrients. A very good type of liquid mixture to give these patients is milk to which milk powder and other flavoring materials have been added. A good food concentrate for routine use is an egg nog consisting of one egg, eight ounces of milk and two ounces of a dried milk mixture. A glassful of this mixture will add fifty grams of protein to the diet. The response of the patient to an adequate diet is astonishing to one accustomed to the traditional postoperative asthenia and lengthy convalescence of the past. Wound healing is accelerated and the possibility of intercurrent infection is lessened. Instead of several months of disability patients are now out of bed many times the first postoperative day, walking as soon as their condition permits and out of the hospital and back to work in a minimum of time.

THE CARE OF THE CONVALESCENT CARDIAC PATIENT*

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During the past decade, along with the increasing awareness of the prevalence of heart diseases and the major advances in therapy, considerable optimism has grown up concerning cardiac patients. Instead of the fear and invalidism previously imposed upon them, it is now appreciated that a long, useful life may be led in the presence of even advanced heart disease. Persons with marked changes in the electrocardiogram, such as bundle branch block, may be asymptomatic or comfortable and live their normal life span. Furthermore, it is now realized that, while rest is extremely important in the management of heart diseases, the extended periods of bed rest and convalescence previously prescribed are in many cases unnecessarily prolonged. This knowledge is, of course, full of significance in conducting a convalescent home, from which in the past the cardiac patient has been in large part prohibited and which, actually, can be a decisive factor in his rehabilitation from an acute illness.

In all acute cardiac episodes bed rest is the basis of therapy and may be prolonged. As a result of inactivity, the muscle tone of the body often becomes poor, and when the patient leaves the bed, he is apt to complain of weakness and shortness of breath. This tendency is often increased by anxiety concerning his heart, which actually may be functioning well. In such patients graduated exercise is valuable to hasten restoration of good circulatory and muscular function as well as morale. This end is best achieved at a convalescent home in company with other patients in a similar condition. Here the patient is able to take short, slow walks on level ground which may be impossible at home.

The types of heart conditions encountered for convalescent care may be divided into three main groups as follows: (1) acute coronary occlusion or insufficiency with myocardial infarction, (2) acute rheumatic fever, (3) acute congestive failure as evidenced by shortness of breath, edema and fluid in the body cavities. Congestive failure occurs in any type of heart disease including (in addition to coronary artery and rheumatic heart disease) that caused by hypertension, chronic lung disease, syphilis, hyperthyroidism and congenital anomalies.

Coronary occlusion or insufficiency: There is some difference of opinion as to the period of bed rest and convalescence required following myocardial infarction. Usually the patient has been kept in bed four to six weeks, within the house two more weeks and then allowed to convalesce six or more weeks. However, it must be remembered that the severity of acute coronary episodes varies tremendously and, therefore, therapy should be individualized; each case being treated according to the symptoms and signs. Thus, it is important to distinguish attacks of acute coronary occlusion from acute coronary insufficiency, which can usually be done electrocardiographically. Coronary occlusion is associated with Q-waves and RS-T elevation, coronary insufficiency only with RS-T depression and T-wave changes. In general, the symptoms of coronary insufficiency are milder and of shorter duration; it causes only focal subendocardial necrosis

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and is therefore associated with relatively rapid recovery, i.e., two to three weeks. On the other hand, the patient should be kept in bed about two weeks in the majority of cases. Coronary occlusion usually produces a large, through and through infarct which would appear to require a longer period of repair. There are but a few scattered pathological and experimental data concerning this point, which indicate a period of six weeks as necessary for formation of a firm scar. Three weeks are required to develop collateral circulation and to avoid aneurysmal bulging. It must be remembered that these data in human material are confined to the more severe, fatal cases and may not be apposite to the mild cases of coronary occlusion which are completely asymptomatic following the initial episode of pain. In such benign cases several authors have suggested two or three weeks of bed rest followed by a similar period of slow, progressive ambulation. Our own observations of such a regime in patients running a benign course of coronary occlusion have also been favorable. There are many patients with coronary insufficiency or occlusion who may be ready for convalescent care three to five weeks after the attack. Such a patient is able to care for himself and perform mild activity. The period of convalescence should be three or four weeks during which he progressively increases his activity. Relatively little supervision is required by this patient. If he is instructed at the outset, he will avoid excessive effort; should pain appear, it is usually relieved by nitroglycerin, and a hypodermic is only rarely required.

The patient who has experienced a severe attack, i.e., with prolonged tachycardia, congestive failure, etc., requires four to eight weeks in bed and slow ambulation for three or four weeks before convalescent care is to be considered. The period of convalescence should be at least six weeks. Such a patient's quarters should be placed centrally at first so that minimal activity is necessary.

Rheumatic Fever: The patient with rheumatic fever should be kept in bed until evidence of activity has disappeared, i.e., the temperature and pulse rate are normal and the sedimentation rate and electrocardiogram are normal or stationary. Then the patient is slowly permitted out of bed and a recurrence of activity watched for. The reappearance of mild joint pain does not necessarily indicate activity. Several authors have suggested ambulation even in the presence of probable mild activity. As a rule reactivation occurs within the first week or two of ambulation. If this passes uneventfully, the patient may be considered ready for convalescent care which is so important to recovery. As a rule these patients, usually adolescents or young adults, offer no problem in the convalescent home. It is advisable to record their temperature and pulse rate daily. Their activity may have to be supervised. Of major importance is the avoidance of colds and streptococcal infection. It is therefore preferable, if possible, to house these convalescent rheumatic patients separately.

Congestive Failure: Patients recovering from congestive failure, no matter what the type of heart disease, require more surveillance than those convalescing from coronary occlusion or rheumatic fever. Even when recovery seems complete, signs of congestive failure may reappear either insidiously or acutely. However, with the usual precautions observed in this condition, i.e., low salt diet, digitalis, thiomerin or mercurhydrin given subcutaneously, once or twice a

week, and ammonium chloride, the reaccumulation of fluid should be prevented or slowed sufficiently so that acute situations should not arise. The rate of recovery and convalescence depends upon the severity of the attack. Naturally, before admission to a convalescent home, the patient must be free of fluid and permitted to regain his strength since congestive failure often is associated with considerable asthenia. Except in the very severe, persistent cases, this can usually be effected in two to four weeks, i.e., one or two weeks after disappearance of the edema. During this time the patient has become ambulatory and tested for recurrence of edema. These patients often experience shortness of breath, weakness and fatiguability at this stage, but these symptoms may be the result of inaction and fear.

At the convalescent home a simple but reliable method of detecting the onset of invisible edema is to weigh the patient daily. A sudden gain of several pounds suggests congestive failure, even in the absence of dyspnea, and the nurse may give a mercurial injection. Of course, patients recently recovered from congestive failure should be on a salt poor diet, i.e., one containing approximately 2 gm of sodium chloride. This can usually be arranged without too great effort by the diet kitchen. Tomato juice and medications containing sodium should be avoided. Often vitamins and small doses of dextrine are helpful in overcoming asthenia.

The convalescent home is not only a place for the patient to regain his strength and cardiac reserve but, perhaps more important, it may be used to encourage the patient and help him to emotional stability. The cardiac patient usually lives in perpetual anxiety and fear of death. His is the narrow world of the sick who are diffident and dependent. They must be given reassurance and made to realize that they can again become useful and often gainful. Their interests must be broadened and directed into healthy channels. They can then give up their attitude of dependence. Depending on the seriousness of their condition, they must realize their limitations and face reality but never should their spirit be overwhelmed.

At first their past interests should be revived and encouraged as far as possible. Various types of occupational therapy may be employed. It may be possible to attempt vocational rehabilitation. Of course, it may be necessary to lead the patient into a new type of work less strenuous or demanding than his previous occupation.

During convalescence, recreational facilities are of great value, particularly for those unable to engage in occupational or vocational therapy. In addition to motion pictures, various types of games, books and music should be available.

It would be of great advantage to have a psychiatrist attached to the convalescent home, either part time or as consultant, who may be able to interview each patient briefly and thus select those who require further assistance.

It is well recognized that there is an acute shortage of convalescent facilities for cardiac patients. This is true, particularly, of those between the ages of 14 and 20 years. This need can be only partially relieved by admitting cardiac patients to the present convalescent homes. The need for additional facilities erected for cardiac patients alone, should be borne in mind by those concerned with the problems of convalescent care.

CONVALESCENT THERAPY FOLLOWING OPERATIONS UPON THE STOMACH*

PERCY KLINGENSTEIN, M.D.

GENERAL CONSIDERATIONS

Convalescence has been described and is generally considered to be that stage which takes place progressively from the time disease ceases to attack up to the time when the patient is again in normal health. This concept is as old as man's first illness. Heylerus (1) in his graduation thesis in 1732 at Leipsic compiled the opinions of earlier authorities under the title: "De Statu Convalescentia." The changes in the concept of the nature of convalescence with the principle of continuity of medical care and responsibility accepted by the convalescent agency has greatly broadened the entire scope of medical practice in this field. The value of proper convalescent care is considered to be the opportunity it offers for the recuperative process to continue uninterruptedly and thus hasten the return of the patient to his customary mode of life and work. Along with this orientation, modern surgical practices have considerably shortened the hospital stay of patients following operation.

Early ambulation, while not a new therapeutic concept, has gradually become a routine postoperative measure. Not only has it resulted in benefit to the patient in the immediate postoperative course, as attested by Powers (2) and Whipple (3) who reported on 500 and 1000 patients respectively so managed and benefited, but it has resulted in a marked reduction in the in-hospital stay of patients following operation. This measure in combination with marked improvement in anteoperative preparation for surgery and advances in postoperative therapy, increased skill in carrying out complicated surgical procedures, has resulted in a marked shortening of the in-hospital stay of patients recovering from stomach operations. Within the memory of the writer a four-week hospital sojourn was considered an average length of time whereas today, unless the postoperative course is unduly complicated, a patient is ready for discharge within ten days and not infrequently after one week could be considered ready for convalescent care. This results in great benefits to the patient and hospital. The former, upon discharge, realizes he has passed one of the "milestones" upon the road to restored health and activity; the latter can render increased service to the public it serves by making its facilities available to more patients and thereby diminish the size of the list of people seeking hospital admission. This, however, carries with it a responsibility on the part of those in whose care the convalescent is entrusted. This is singularly relevant to the large group of patients who have undergone a gastric operation. A knowledge of the nature of the surgical procedure, the altered physiological mechanisms and their by-effects, an awareness of the complications that can and occasionally do occur in the convalescent period following this type of surgical procedure, must be appreciated

* From the Surgical Service of Dr. Ralph Colp.

in order not only to care for individual symptoms as they arise but to provide an integrated program of convalescence. Insofar as is possible, the specific problems related to the "gastric" patient will be stressed in contradistinction to the general convalescent problem of any laparotomized patient although, here, too, certain situational factors will need to be emphasized.

Operations on the stomach, in the main, are performed for two types of disease: ulcers and new-growths. In the former group the ulcer is either located in the stomach itself or in the duodenum. For the most part, duodenal ulcer is a disease of males in contradistinction to gastric ulcer which more nearly affects both sexes equally. The male patient who had been operated upon for duodenal ulcer is usually in the "bread-winning" age group who has been treated surgically only after a prolonged period of medical therapy or for some complication of the ulcer such as perforation, bleeding or stenosis. It has long been felt that this group as a whole manifest a characteristic personality pattern or conflict situation which is accompanied by or leads to hypersecretion, hypermotility and other abnormalities of gastric function. It is important that this concept be stressed in all ulcer patients to the end that whenever possible the interrelationship of the patient to this disease be taken cognizance of in any convalescent regimen. Operations for ulcer are symptomatic in that they cannot eliminate the underlying diathesis although they aim to cure the disease by eliminating the acid-secretory factor which, if completely eliminated, results in cure. This is variously accomplished. The operation most commonly practiced is subtotal resection of the stomach. This entails removing about three-fourths of the stomach and establishing gastrointestinal continuity by anastomosing the most proximal jejunum to the cut stomach end. In the older age group or in patients in whom it is thought contraindicated because of attendant medical complications, a posterior gastroenterostomy is done. The beneficial results of this procedure is brought about by a regurgitant neutralization of the excess acid secretions in contradistinction to gastrectomy which seeks to eliminate the hormonal stimulus to gastric secretion contained in the antrum of the stomach which is resected. Recently, alone, or in combination with either of these operations, resection of both vagus nerves has been employed in a further effort to diminish the secretion of acid. This procedure is particularly applicable in patients who have recurrent ulceration at the stoma or who have bled without demonstrable ulcers being found at operation.

In the main, gastric ulcer is similarly managed as is the duodenal variety. Yet the physiological alterations here are noteworthy in that gastrectomy uniformly produces an anacidity which leads to cure in practically one hundred per cent of patients so managed.

Operations for malignant disease of the stomach run the gamut between those unfortunate individuals in whom the disease has already spread beyond the anatomical boundaries of removal, rendering them completely inoperable, and those in whom resection can be done but the disease not completely encompassed and those in whom extensive removal of a confined growth for prolonged alleviation, if not cure. Complete gastrectomy, now practiced more frequently than

ever before, poses problems in convalescent management which will be enumerated subsequently. Operative approach to the stomach is most commonly practiced through an abdominal incision although tumors of the upper end or cardia are frequently removed trans-thoracically or through a combined abdomino-thoracic incision. This type of incision is prone to give rise to convalescent symptoms which will be discussed under the general management of the "wound."

It is obvious that, following a gastroenterostomy or gastric resection, the physiology of the stomach is abruptly changed. In the presence of destruction the stomach enlarges in size and the total weight of the stomach musculature increases. In aggravated instances the stomach may become atonic and peristaltic waves diminish both in frequency and power. Following operation, the increased force and heights of the peristaltic phenomena diminish at quite a rapid rate and even in the long neglected case the dilatation diminishes and the peristalses are less vigorous and run in more normal sequence. One is dealing then with a stomach in which normal function has been disturbed for a considerable period of time with the factor producing it (obstruction) suddenly done away with by the gastroenterostomy or gastrectomy. There is, in addition, a stomach that is frequently the seat of a gastritis. In patients who have had a vagotomy, gastric distention and delayed emptying with diminution in the number and activity of the peristaltic waves are the physiological result of this neurogenic interruption. This complication is less in evidence if gastroenterostomy accompanies the vagotomy.

It is readily discernible that these altered physiological mechanisms cannot be entirely eliminated by the time a patient has made an operative recovery of sufficient degree to permit hospital discharge and it is in the convalescent period that detailed attention must be directed to these factors which not infrequently influence convalescent symptomatology and form the basis for completely restored gastric function.

Other general constitutional deficiencies as the result of long standing ulcer disease not completely remedied by either pre- or postoperative therapy will be enumerated here to be discussed more fully under the appropriate section of convalescent management. Anemia following operation, particularly in patients who have bled before surgery, is commonplace. Loss of weight and muscular tone go hand in hand. Marked protein deficiency (hypoproteinemia), in spite of replacement therapy, is frequently not completely replenished. Vitamin deficiencies are a common sequel of ulcer disease with its complications as well as in malignant disease of the stomach.

CONVALESCENT MANAGEMENT OF SPECIFIC PROBLEMS RELATED TO THE SURGERY OF THE STOMACH

Wound Management and Care. Even though patients are not discharged until their wounds are healed, it is not uncommon for convalescent complications to occur. The incision is the tell-tale evidence of the surgical procedure and the patient is prone to pay particular attention to this phase of his altered anatomy.

The incision usually employed is an epigastric one, in some instances reaching as high as the xiphoid process. Very seldom this cartilage may be traumatized by a retractor with resultant pain. Stainless steel wire is frequently used as suture material which if not cut sufficiently short and inverted may present as tiny palpable nodules along the course of the incision occasionally even becoming somewhat sensitive upon palpation. With increased exercise during the convalescent period, the patient may complain of pain and become apprehensive of their presence. Reassurance and warm compresses will suffice. The wound may occasionally become the seat of delayed suppuration presenting all the classical symptoms and signs of infection, viz., induration, redness, warmth and swelling. These infections are for the most part localized and form a small abscess under conservative management which can be readily incised when they present subcutaneously.

In patients in whom the duodenal stump has been drained, final healing frequently has not occurred upon discharge. For the most part secretion from the sinus is serous and presents no problem. On the other hand, the drainage occasionally is persistent and frankly purulent and accompanied by a sense of right upper quadrant fullness not infrequently associated with pain. This may be caused by an infected nonabsorbable suture, either silk or linen, or by a periduodenal exudate in some cases of sizable proportions. Temperature is usually present and for the most part the exudate will subside under appropriate antibiotic therapy, and warm tub baths. Rarely do these localized suppurations go on to form subhepatic abscesses which require incision. Commonly, the offending suture will present itself in the lip of the wound. After removal the sinus will close spontaneously with subsidence of the pain and induration.

Combined abdomino-thoracic incisions have a tendency to be tender and frequently patients complain bitterly of intercostal pain. If excessive, thus preventing the patient from indulging in a rehabilitation program, intercostal nerve block should be done. Patients, aside from a very occasional one who has had a transthoracic vagotomy (now very uncommonly practiced), have had the incision used for cardiac resection or total gastrectomy and unless the wound is painless respiration will be guarded. In this elderly, already depleted group diminished respiratory excursion often results in decreased vital capacity and atelectasis with its tendency to pneumonitis.

Intraabdominal Suppuration and Subphrenic Abscess. Whereas the incidence of these complications has been markedly decreased as the result of improvement in the technic of gastric surgery and the almost routine use of antibiotic therapy in the postoperative period, localized intraabdominal infection can still manifest itself in the convalescent period. As a rule, these patients have run a somewhat stormier postoperative course, have had more abdominal distention and gastric retention than normal, and the temperature has persisted for a longer time than ordinarily anticipated. The recovery, although retarded, is deemed complete. In the convalescent period the patient is again prone to run temperature. Costal pain, increased by respiration, or shoulder pain should immediately raise the suspicion of a subphrenic collection. Fluoroscopy to determine the excursions

of the leaves of the diaphragm and x-ray studies should be made. Not infrequently, a left-sided subphrenic abscess will be difficult to detect until a Seidlitz powder is ingested to outline the stump of stomach, the distance of the "Magenblase" from the diaphragm serving as a means of appreciating the presence or absence of an abscess in this region. I should advise against exploratory aspiration to establish the diagnosis in a convalescent home. Occasionally a residual pelvic abscess will manifest itself by frequent bowel movements, rectal tenesmus, frequency of and painful micturition.

Chest Complications in Convalescence. Thanks to antibiotic therapy, postoperative pulmonary complications no longer hold the dread for the gastric surgeon they formerly did, but this does not mean they have become completely extinct. Particularly in the aged, long standing chronic bronchitis with bronchial dilatation or in some cases even well developed bronchiectasis is existent prior to operation. The unwillingness of these patients to empty their bronchi because of the pain incident to coughing often results in patchy atelectasis and pneumonitis. They still harbor areas of consolidation sometimes only visible on X-Ray and not appreciated clinically. Whereas these infections are prophylactically dealt with by bronchoscopic aspiration and usually are completely subsided at the time of discharge, it is noteworthy that their incidence is unusually high following gastric operations. That some of these patients will carry symptoms of their pneumonitis into the convalescent period is highly likely and efforts must be directed to prevent reinfection, lessen the embarrassing cough and note any change in the amount or nature of the expectorated material in order to appreciate an occasional pulmonary abscess. Fluid in a costo-phrenic sinus may be a residuum of a pneumonitis or presage a subphrenic purulent collection. Chest pain will be discussed in the following paragraph.

Venous Thrombosis. Not infrequently, postoperative venous thrombosis will occur in the convalescent period. Unfortunately there is no evidence that early ambulation has diminished the incidence of this postoperative complication. Frequently signs are meager and the occasional leg pain complained of by the patient is considered to be of muscular origin. There may be little if any evidence of swelling, discoloration or tenderness and the only clinical feature may be a slight rise in temperature which, if unexplained, should direct attention to the extremities as its possible source. The importance of this complication is the danger of pulmonary embolism and any chest pain made worse by deep inspiration unless completely accounted for by a local pulmonary process should direct attention to a phlebothrombosis, with pulmonary embolism as the etiological factor. The patient recovered from a known postoperative thrombophlebitis presents a problem in convalescent management and it is here that much can be accomplished in preventing a very disabling condition known as the "post-phlebotic syndrome." In these cases, the limbs become swollen in the erect position with marked venous stasis. If untreated at the inception, prolonged disability ensues usually ending in chronic malleolar ulceration. Supportive bandages very exactly applied serve in most instances to lessen the swelling. The patient should sleep with the limb elevated and the bandages applied before arising in

the morning. In some instances a Unna starch paste type of bandage should be used until a well-fitting elastic stocking can be procured.

Body Stores of Proteins, Vitamins, and Anemia. All the detailed attention prior to and after operation pertaining to 1) the state of hydration; 2) the body stores of protein; 3) the total daily caloric intake; 4) the vitamin intake; and 5) the presence or absence of anemia are all most important in the convalescent period. The state of hydration of patients who are taking food by mouth in ample quantity poses no problem. If vomiting or diarrhea should occur in a patient preoperatively dehydrated, it may require a prompt institution of parenteral fluids. Inability to retain and digest an ordinary well-balanced diet leads the patient with a lesion of the upper gastrointestinal tract to adopt an easily digested, high carbohydrate diet. Such patients as a rule are hypoproteinemic. Even though the parenteral protein hydrolysates in the pre- and postoperative period supply the tissues with readily assimilable amino-acids, the ordinary postoperative diet is not sufficiently rich in proteins and great efforts should be expended in the convalescent period to supply a sufficiently high protein diet to overcome all tendency to hypoproteinemia. Anemia is frequently of marked degree in bleeding duodenal ulcer and in carcinoma of the stomach. Even though blood transfusions in the pre- and postoperative period elevates the hemoglobin to a point at which surgery is considered safe, the loss of blood at operation, a much larger quantity than is ordinarily appreciated, and the bloody drainage from the stomach after operation makes frequent hemoglobin determinations advisable in the convalescent period. It is surprising to find how low hemoglobin values can be without any clinical manifestations. Iron therapy with the judicious use of even a single blood transfusion can act as a stimulus to new red cell formation in the absence of which the anemia would persist unduly long and retard convalescence. Deficiencies of Vitamin C and members of the B complex are almost uniformly present in patients undergoing gastric surgery and should be continued throughout the convalescent period.

Bowel Habits. As a rule, patients will carry over into the convalescent period their regularly established bowel habits. Occasionally after vagotomy patients previously constipated will notice a regularity not previously experienced and in a very few instances frequent bowel movements will result. Patients should be encouraged to have a daily evacuation without recourse to cathartics or enemata, although in certain instances mild laxatives may have to be used until regular bowel habits have become reestablished.

Gastric Function with Particular Emphasis on Diet in Convalescence. In spite of every other consideration in the convalescent management of the ulcer patient, none is of greater importance than the intelligent management and advice for symptoms referable to the ingestion of food. The patient who has suffered lengthily and severely, usually over a long period of time and who submits to surgery for the cure of his ulcer, naturally anticipates the hope that he will no longer need dietary restrictions and that his stomach trouble is now happily a thing of the past. To be sure, certain preoperative symptoms will have disappeared as the result of operation. The ulcer pain will have been relieved. Vomiting as the

result of obstruction will have disappeared but, as previously mentioned, surgery will have effected a change in the physiology of digestion and gastric motor activity which will need to be translated into 1) an evaluation of certain gastric symptoms in the convalescent period, and 2) the institution of a dietary regimen which will best meet the needs of this altered mechanism.

It is not unusual for a patient to notice after gastrectomy that epigastric fullness comes on if a full meal is assayed. Occasionally, eructation and belching will occur as will heartburn in a number of cases. The fully developed post-gastrectomy syndrome studied by Adlersberg and Hammerschlag (4) in which dizziness, profuse perspiration, palpitation and weakness occur after the intake of food usually comes on later than the convalescent period but steps should be taken should any of these symptoms be complained of to orient the patient and advise him as to the proper spacing of meals, the quantity of food to be taken at one time, and to reassure him that once his stomach is acclimated to the changed capacity for food, symptoms will largely abate. I feel that although some of these symptoms are undoubtedly caused by mechanical factors, small stomach and rapid emptying with the rapid passage of food into the jejunum, patients of the emotional, high-strung, asthenic type are most apt to develop this train of sequelae. It is in the convalescent period that they should be encouraged by sympathetic understanding, for if the condition becomes exaggerated, a vicious circle is created which may result in what is commonly called the "gastric cripple." These patients may have serious psychoneurotic manifestations and should if possible be seen by a psychiatrist early, after operation. This train of symptoms is usually bound up with an inability to gain weight and while weight loss prior to, and after, operation is considerable, a number of gastrectomized patients find it very difficult ever to attain their previous best weight.

Practically every ulcer patient subject to a restricted diet finds himself obsessed by an intense craving for tasty and nourishing food. His appetite is good and his desire for food unimpaired. It is not surprising therefore that many of the patients will crave for highly seasoned, spiced foods which should be interdicted.

I am not prepared to prescribe a regimented convalescent diet for a gastric patient but the following advice should be adhered to: 1) Not to eat anything that, by experience, causes distress; 2) Not to eat fried foods of any kind; 3) Not to eat pickled or cured meats; 4) Not to eat clams, canned, or very oily fish; 5) Not to eat relishes or pickles. In the main, the diet should be rich in proteins, highly calorogenic without great bulk, and appetizingly prepared. A well balanced diet in the convalescent period may well be composed of a choice of the following items: eggs, 2 or 4 in a day, cooked in any way; bread and rolls of any type; milk, from 2 to 4 glasses a day; unsalted butter, liberally; purees and bisques; hashed and creamed vegetables; scraped or chopped meat, chicken, fish, not including salmon and sardines, and preferably boiled; cereals; cheese (cottage, cream, pot cheese); apple sauce, baked apples, bananas; custards of all kinds, no raisins; gelatine and jello; chocolate, cocoa, milk and egg nogs.

Occasionally a patient will develop an intolerance for milk and various substitutes can be tried.

Specific problems in convalescent management of the patient, who has had a total gastrectomy resolve themselves mostly in frequent two-hourly feedings of a semi-soft, highly caloric type of diet, amply fortified by vitamins.

Occasionally, a patient will need jejunostomy feedings. The aliment as advocated by Hollander will furnish the necessary calories, minerals, ash and vitamins. It is important to see that the feedings are given slowly, that the tube remains patent and that the aliment does not occasion diarrhea or abdominal cramps. Needless to say, the tube should be made secure and care should be exercised that it is not displaced.

SUMMARY

The problem of the convalescent management of the patient recovering from a gastric operation has been approached from the standpoint of 1) the importance of appreciating the fact that early discharge from the hospital entails an added responsibility for careful observation and evaluation of the patient, and 2) an appreciation of the altered gastric function and physiology which makes convalescent care both a challenge and a most important step on the road to physical and economic rehabilitation.

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CARE OF THE COLOSTOMY*

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The large number of intestinal operations now being performed on many of the surgical services throughout the country has given rise to the need for increased convalescent facilities for patients with abdominal colostomies. Yet it is particularly the patient with a colostomy who finds great difficulty in gaining admission to an institution for convalescent care. The usual objections to accepting a patient with a colostomy are: the disturbing fecal odor; the excessive time required of the nursing personnel; the inadequacy of bathroom facilities.

Much of the resistance to the admission of a patient with a colostomy, however, would disappear if it were realized that the management of the colostomy can be simple, may be undertaken by the patient personally without assistance, and actually may require no more total time per week in the bathroom than is taken up by the average convalescent patient. Moreover, many of the offensive features are due to poor management and to lack of experience in the handling of some of the difficulties which may arise.

The following statements summarize some of the principles and details of management in the hope that they may be of aid to nurses, attendants and physicians whose experience with colostomy problems is limited because of infrequent contacts.

Lest an erroneous impression be obtained of the number of difficulties arising in the general management of a colostomy, it is to be realized that this paper is concerned largely with the handling of the complications, in order that the relatively few people who find difficulty may join the ranks of the great majority who have succeeded in complete and confident mastery over their colostomies.

Colostomies may be permanent or temporary. The permanent type most often found is the terminal opening of the sigmoid and is usually located in the lower abdomen. This terminal colostomy is the one most feared and yet is the easiest to control. The temporary colostomy may be 1) loop type; 2) double-barrelled with a spur; 3) double barrelled with separation of the limbs. They may be present in any quadrant of the abdomen and may be placed in the cecum, transverse, descending or sigmoid colon.

THE PERMANENT COLOSTOMY

The Diet. The purpose of dietary control is to constipate the patient so that the colostomy will not function except upon irrigation. Thus, a well controlled colostomy is one which functions only when the patient decides it is to work. The following is a composite set of instructions which have been found successful in attaining desired dietary control.

Foundation diet: (The following foods may be eaten to obtain regulation)

Meats: bacon, liver, beef, chicken, lamb.

Fish: boiled or broiled.

* From the Surgical Service of Dr. J. H. Garlock.

Eggs: boiled, scrambled, poached.

Vegetables: potato, rice.

Bread: toast, white or rye; plain crackers.

Cereals: farina, cream of wheat, puffed rice or wheat, corn flakes, rice krispies, strained oatmeal, noodles, spaghetti without sauce.

Beverages: weak coffee, weak tea, light cream, boiled milk.

Soup: without vegetables or spices.

Desserts: custards, cornstarch puddings, junkets, gelatins, rice puddings, tapioca, simple cakes and cookies, plain ice cream, sugar.

Additions: (These foods may be added after regulation is obtained)

Juices: strained orange juice.

Fruit: banana, canned or cooked peaches, apricots, pears, applesauce, baked apple without skin.

Vegetables: pureed. If purees are tolerated, then try cooked vegetables, tender carrots, beets, squash, asparagus, green lettuce in small amounts with plain mayonnaise.

Milk: unboiled

Cheeses: cream, American and Swiss.

Desserts: Jelly or jams without seeds.

Prohibitions: (these foods usually interfere with regulation)

Spices: such as mustard, horseradish, catsup, vinegar.

Uncooked vegetables: cucumbers, spinach, celery, cabbage.

Raw fruits.

Beverages: iced, charged.

Cereals: brans, wheats.

Breads: whole wheat, pumpernickel.

Meats: pork, veal, duck.

Fried foods.

Instructions to the patient:

The foregoing diet is used to produce constipation. When the colostomy is regulated, the additions may be tried. If the colostomy still remains regulated, further experimentation is allowed by adding one food at a time.

Individuals may react differently to the same foods, and it is essential that the particular food which causes diarrhea or flatulence be determined by the method of trial and error in each patient. Indeed, there are some patients in whom an unrestricted and varied diet may have no ill effect at all on colostomy management, while others cannot violate the strict rules one iota without recurrence of annoying looseness or frequency of bowel movements. This regimen therefore is suggested as a pattern to be observed or modified according to the needs of the individual.

The Irrigation.

Schedule. The frequency of irrigation will vary among individuals from daily to twice weekly. The majority of patients find irrigation every other day most

suitable. It is probably best to start a regimen of irrigation every other day, coupled with the dietary management, while the patient is still in the hospital. Only after the routine has been well under way should modifications be attempted. Most patients use the early morning for irrigation. This practice is usually satisfactory, but for some it may be advantageous to irrigate the colostomy before bedtime. This is a particularly convenient period for those who require a relatively long time or who find that shortly after completion of the irrigation a secondary bowel movement occurs. In such cases, use of the evening hour obviates interference with the day's activities.

Apparatus. There are many apparatuses for irrigating the colostomy, varying from the simple tube and basin to elaborate metal, plastic and rubber outfits. While the patient is still in the hospital, the nurse usually performs the irrigations by means of a catheter and catches the outflow of feces in a basin held beneath the colostomy. Before discharge from the hospital, it is a good plan for the patient to learn how to irrigate himself, preferably by means of an apparatus which permits him to sit on the toilet. He introduces the catheter through the apparatus, which is strapped around the waist, and then irrigates allowing the fecal return to flow out and into the bowl by means of an outlet. There are several such commercial outfits which are very efficient, easy to keep clean and simple to handle.

Tube. The irrigating tube should be well lubricated with jelly, and introduced into the colostomy 3 to 6 inches, without pressure. The distance of introduction will vary according to the angle at which the bowel is brought to the surface and to the needs of the patient. Some achieve the best results after introduction of the tube even further than suggested and others introduce the tube only 2 inches.

Fluid. The water is run in by means of an irrigating can or enema bag hung at about eye level. Plain, lukewarm tap water is usually most effective and is not irritating. Occasionally, in individual cases, soap suds or sodium bicarbonate may be added to the water. The amount of water needed is also variable, usually amounting to between 2 and 3 quarts. Some divide the total quantity into several portions, introducing a half or a third of the amount each time and awaiting the discharge of the water and bowel contents before instilling the remainder. For those whose colons empty slowly, however, it is better to introduce the entire quantity all at once, and then to wait until all the water and the fecal contents have been ejected. Sometimes, a combination of both procedures is effective, using most of the volume in one instillation, but leaving a small amount to test the results of the irrigation at the end. The goal of the irrigating procedure is to empty the lower colon, leaving little or no material which can issue forth at an inopportune time.

Duration. The duration of the entire procedure depends on the efficiency of the patient, the rapidity with which the colon empties, and the length of time it takes for the colon to become quiescent again. There are some who find that a secondary outflow occurs a short time after completion of the procedure. It is better for these people to wear dressings or to remain on the toilet until this event occurs and, as mentioned before, to irrigate at night instead of in the morning. The total time for the complete procedure, while perhaps considerably

longer at first, should eventually reach about 45 minutes. If performed three times per week, the total time consumed is probably less than the time spent in defecation by most people, and it is certainly less than the total time consumed by patients with diarrhea.

Complications. These instructions usually suffice for the vast majority of colostomies, but minor difficulties occasionally arise. The stool may become too hard and dry, and resist the effects of water. The feces may be softened by the introduction of a few ounces of warm mineral or olive oil into the colostomy (by means of the same enema can used for irrigation) about 15-30 minutes before the actual irrigation process is begun. Extreme dryness of stools may also be avoided by drinking fruit juices about 12 hours before an irrigation. This will produce a more active colon and softer contents at the time of the irrigation. Sometimes small doses of a saline laxative (e.g. milk of magnesia) may be as effective as fruit juices. Too large a dose however may cause loose movements and defeat the purpose of the constipating diet. In the event of diarrheal movements, either as an acute occurrence or as a frequent event, small doses of tincture of opium (10-20 drops t.i.d.) or full doses of bismuth subcarbonate (20 grs. q.i.d.) may be necessary. Usually, the only conditions requiring these drugs for prolonged periods are ulcerative or irritative colitis concomitant with the pathological lesion for which the permanent colostomy was performed. Occasionally, dilute hydrochloric acid orally is effective in people with "gastrogenous" diarrhea.

A few other complications may occasionally arise. A stricture at the skin margin or, more deeply, at the fascial edges of the colostomy may cause great difficulty in introducing the irrigating tube. Finger dilatation or operative revision of the colostomy may then be necessary. Sometimes forcible introduction of the tube may cause considerable bleeding. This is not a cause for alarm since it usually ceases spontaneously and does not require special care. Cases of perforation produced by the irrigating tube have been reported but these are uncommon. They are usually produced by hard rubber tips. Usually, the patient has to be encouraged to introduce the tube to the proper depth, rather than to be cautioned against rashness or roughness.

Interval Care. Patients who have a permanent terminal colostomy should not use a colostomy bag. Such appliances are difficult to keep clean and odorless. They are irritating to the skin, lead to prolapse of the sigmoid by producing suction and defeat the object of the colostomy routine. The colostomy should be brought under control by the dietary and irrigation schedules alone. A small piece of lightly vaselized gauze is all that is required as a covering. Some patients prefer a square of cellophane or a light paper material instead, but bulky dressings are not necessary or advisable. Women may wear their girdles over the light dressing and men may use a wide elastic band, such as an athletic supporter with a wide waist band. The skin should be cleaned with soap and water. Baths or showers may be taken at any time. Mineral oil is useful as a cleanser for the surrounding skin after the colostomy has functioned.

There is one annoying complication which occasionally is difficult to control, the passage of flatus. Usually for each patient there is a particular food or group

of foods which produces flatulence. Certainly charged waters should be eliminated from the diet of people with flatulence. There are commercially available a number of orally administered drugs which may be effective in controlling and in rendering odorless the gas passed per colostomy (e.g. carbisol capsules). Activated charcoal is usually the effective ingredient. Sometimes gas odors may be overcome by sprinkling on the dressing a few drops of a pleasant smelling substance, such as oil of pine.

Mental Attitude. Probably most important in the management of a colostomy is the attitude of the patient toward himself, his colostomy, and his environment. He must be surrounded by an atmosphere of intelligent optimism on the part of his doctor, family, friends and nursing personnel. It is important to instill in him early a sense of confidence in his ability eventually to keep the colostomy under control and to engage in a full and active life. He must be encouraged to take the initiative in modifying the outlined routine, and to learn by experimentation how to cope with problems which may arise. It is often useful for the physician to combine a casual but realistic attitude toward the presence of the colostomy with a willingness to discuss with the patient the small difficulties and the numerous fears which may arise, before they grow to unwarranted proportions. One must steer a middle course, on the one hand giving the patient time, attention, instruction and encouragement; on the other hand avoiding an attitude which may lead to fixation on his infirmity and to overdependency on outside help. The story is told of an elderly surgeon who invited a large throng of his patients to dinner and as they were leaving, informing them each privately that all present had colostomies. By this means he helped each to avoid self pity and to obtain increased confidence.

THE TEMPORARY COLOSTOMY

The temporary colostomy may be more difficult to control than the permanent because it is usually not planned for future use. It may be placed in any location on the abdominal wall, depending on the operative requirements and the location of the pathological lesion in the intestinal tract. The colostomy may be preliminary to a later resection, a concomitant part of the resection, or a complementary procedure at the conclusion of the resection. If the interval before closure of the colostomy is more than a few weeks, it is wise to employ dietary control and irrigation whenever possible. The same regimen as used for the permanent sigmoid colostomy can usually be followed.

There are several types of temporary colostomies, each of which may require special modifications in management.

The loop colostomy: In this type, a loop of colon or cecum is lifted to the abdominal wall and subsequently opened. The colonic passageway is thus uninterrupted and stool often passes the colostomy opening continuing its course along the colon. Such stool will eventually reach the rectum, especially when there is no longer any obstruction. This may lead to fecal impaction in the rectum which requires appropriate treatment. When this type of colostomy is used as a preliminary or emergency procedure for cleansing the bowel preparatory to a subse-

quent resection of a more distally placed neoplasm, irrigations must be performed distally as well as proximally. If the distal lesion, however, is perforating or is inflammatory (e.g. diverticulitis) and requires protection, then of course distal irrigation is forbidden until the acute stages have passed. The diet depends on the character of the stools. If these are too loose, the strict foundation diet is required, and opiates and bismuth powders may be necessary. If the stool is too constipated, a more liberal diet may be prescribed.

Prolapse of the colostomy is more common with the loop colostomy than with the other types. Suction bags are therefore to be avoided if possible.

The double-barrelled colostomy with spur: In this type, the proximal and distal limbs of colon are placed side by side on the abdominal wall. The principal use of this colostomy is as a concomitant part of the obstructive (exteriorization) resection of a segment of colon, although it may be used as a fecal diverting procedure before the resection of a distal lesion. In this type of colostomy too, irrigations of the distal as well as the proximal limbs depend on whether the distally located lesion is to be protected.

Diet alone sometimes suffices to exert reasonable control without the need of irrigations of the proximal opening. In this type of colostomy, despite the fact that there are separate proximal and distal openings, stool may spill over into the distal limb. Although this is less common than in the loop colostomy, fecal impactions in the rectum must be watched for.

At a suitable time, the spur existing between the two loops of bowel is removed by crushing with a special clamp. When the spur has been cut through, there is then a continuous passage from proximal into distal limb and the colostomy has been thus converted into the loop type. Although the spur crushing is a simple procedure, it requires special management and is a separate topic not pertinent to the present discussion. By the time the patient reaches the convalescent home, the spur has usually been crushed, or else is allowed to remain until subsequent admission to the hospital.

The double-barrelled colostomy with separated openings: In this type, two limbs of bowel are brought to the surface with the two openings separated in order to produce complete fecal diversion. Sometimes such a colostomy is allowed to remain permanently either because the distal lesion is found to be unresectable or because the distal lesion is to be resected later by the perineal route (Lockhart-Mummery). The proximal opening is therefore managed like a permanent colostomy. The handling of the distal lesion depends on the pathological condition for which the procedure was performed. It is important that instructions concerning the care of the distal limb accompany the patient on discharge to a convalescent home or to the care of a visiting nurse.

A special kind of colostomy, described by Devine, combines features of both the spur type and the separated-ends type, but it is probably best considered a variety of the latter from the standpoint of care. This colostomy has two separated openings on the abdominal wall producing complete fecal diversion, but it also has a spur, more deeply placed, which can be crushed eventually to restore intestinal continuity.

ANATOMICAL TYPES

Whether the colostomy is permanent or temporary, there are special features related to the anatomical level of the colon at which the colostomy is placed.

The cecal colostomy: This is really a loop colostomy and usually allows considerable passage of feces into the remainder of the colon. It is the most difficult to manage and, fortunately, is usually temporary. The stool is often quite liquid and may resist both dietary and medicinal attempts at thickening. If required for a long time, a bag often must be worn. However, when the distal obstructing lesion is removed or when the obstruction subsides, the cecostomy may function very little, with most of the intestinal contents passing into the remainder of the colon, permitting the patient to defecate by rectum.

When a bag is found necessary, either the Rutzen bag or the Zaetz receptor have been found to be extremely efficient, easy to manage and cosmetically adequate. The skin about the cecostomy often needs protection. Each hospital and each nurse seems to favor a particular paste. It is probably best not to be too rigid in the choice but rather to have experience with the many methods of skin protection. Some of the pastes frequently employed with great success are: aluminum paste (metallic aluminum powder, zinc oxide ointment and mineral oil); tincture of benzoin followed by powdered aluminum; cod liver oil ointment; "four-way paste" (castor oil 12 gms., zinc oxide 6.4 gms., Aristol 2 gms., petrolatum 25 gms.).

Probably the highest incidence of prolapse is in the cecostomy type of loop colostomy. An elastic support may therefore be very useful. Irrigating apparatuses are usually not suitable for the cecostomy. An ordinary rectal tube or large catheter is usually employed, but the cecostomy often does not require irrigation unless it is used as a means of preparing the distal colon for a subsequent procedure.

The "tube cecostomy" allows the cecum to remain in the peritoneal cavity and drains the cecal lumen by means of a tube brought out through the incision. This tube may require irrigation. It is often difficult to maintain in place and therefore the patient usually remains in the hospital until the tube is removed. Occasionally, however, such a patient is sent to a convalescent home while awaiting the opportune time for subsequent procedures. It is important to use great care to keep the tube in place, for once it slips out the incision usually closes rapidly.

The transverse colostomy: In some transverse colostomies the contents are quite liquid, and a few patients may require a bag (Rutzen or Zaetz), but it is surprising how many have formed stools which can be controlled by diet, with or without irrigations. The skin may require attention to maintain its good condition.

The sigmoid colostomy: The permanent colostomy routine can be used to control all types of sigmoid colostomies, except that an irrigating apparatus may not be suitable for the loop type. For these, dietary control alone without irrigation often is sufficient since spillover into the rectum may take up most of the feces and leave very little to spill on the abdominal wall.

SUMMARY

The principles and details of management of permanent and temporary colostomies are reviewed. The special problems offered by each anatomical type are discussed in an attempt to aid the nursing and medical personnel charged with the care of colostomies in convalescent homes.

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POSTOPERATIVE CARE IN PELVIC SURGERY¹

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It is frequently difficult to stimulate the interest of the interne, resident and surgeon in the problems of postoperative care. Preoperatively, when the patient is a clinical problem, infinite care and skill are devoted to the minutiae of diagnosis; and even when the diagnosis is clear beyond reasonable doubt, confirmatory tests are requested. This enthusiasm is indubitably of benefit to the patient and surgeon alike. The conscientious surgeon requires no stimulation to perfect himself in the technical skills required in the operating room. There, he is on exhibition, so to speak, with a critical audience. However, too often, postoperatively the care of the patient is left in the hands of the youngest member of the staff, who considers it of little importance and is only looking forward to his day in the operating room. In truth, the lowered mortality and morbidity rates in modern times, and the increased operability rates in the aged and those patients with serious medical complications, have in greater part been made possible by newer knowledge of pre- and postoperative care, rather than by the new surgical techniques.

Nutritional Requirements. The well nourished patient requires no particular discussion. Frequently gynecological patients suffer from acute and chronic blood loss. Every effort should be directed to restoration of the hemoglobin and blood volume to normal prior to surgery. Patients with an anemia of long duration withstand surgery poorly even when adequate blood replacement has been accomplished. This is probably due to the deleterious effect of chronic anoxia of the tissues. Elective surgery is advisedly delayed in these patients; and our general rule is not to operate on patients with a hemoglobin below 70 per cent. In patients with acute blood loss such as massive hemorrhage in ectopic pregnancy and incomplete abortion the hemoglobin and red blood cells frequently do not accurately reflect the blood picture due to hemo concentration and reduced blood volume, and may be within normal limits. During prolonged operations the fluid loss from insensible perspiration and through the lungs in the exhaled breath is large and is best restored by continuous 5 per cent glucose in saline intravenous drip. During vaginal plastic operations, the continuous slow blood loss, although at no time alarming to the surgeon, frequently totals a large amount and should be immediately replaced.

Immediately on completion of the operation, our patients are allowed fluids as tolerated, and as soon as possible, usually after 24 hours, are permitted a full diet of approximately 2500 calories. It is our experience that postoperative distention is diminished when solid food is ingested. When, however, an appendectomy has been done or the bowel has been entered, the patient is maintained on a liquid diet for at least three days. Patients who have been operated upon for rectovaginal fistula or following incision and repair of the external rectal sphincter are placed on high protein, low residue diets for at least two days. Bowel move-

¹ From the Gynecological Service of The Mount Sinai Hospital.

ments are inhibited by the administration of opiates. In those patients who are unable to take food enterally the caloric requirement is maintained chiefly by the administration of glucose in distilled water, and protein in the form of plasma and aminoacid mixtures. Serum globulin determination will reveal evidence of hypoproteinemia, the latter is corrected by plasma and whole blood intravenously, and high protein diets when tolerated by mouth.

Vitamins. Debilitated and malnourished individuals will usually have clinical evidence of avitaminosis. More frequently patients will not present overt symptoms but will be in subclinical stages and it is good procedure to administer maintenance doses of multivitamin preparations to all patients postoperatively. It is now generally recognized that vitamins play an important role in surgery. Vitamin C has been established as necessary for the normal healing of wounds and where deficiency is suspected should be administered in adequate doses intramuscularly as well as orally. Vitamin B 1 is essential in the normal metabolism of carbohydrates and supplements to the normal diet are frequently necessary. Vitamin K 1 is essential in the production of prothrombin and the regulation of the normal blood clotting mechanism. Recent investigations indicate that when therapeutic amounts of sulfa drugs are administered by mouth in order to diminish the bacterial count of the gastrointestinal tract in preparation for bowel surgery, within a short time Vitamin K reaches dangerously low levels. Vitamin K supplements must always be given to these patients to avoid dangerous hemorrhage during operation and postoperatively.

Fluid and Electrolyte Balance. An accurate record of intake and output is essential for the proper management of fluid requirement. In the absence of renal damage and cardiac failure a urinary output of 600 cc. to 1000 cc. is a practical indication of adequate fluid intake. Patients in the immediate postoperative period are maintained on parenteral fluids for 24 to 48 hours depending on the general condition and oral intake of the patient. A normal state of hydration and the prevention of acidosis are effected by restoring normal body water content and furnishing sodium chloride and readily available carbohydrates. These demands can be met by the administration of intravenous 5 per cent dextrose in physiologic saline in amounts not exceeding 1000-1500 cc. daily to supply a total intake of 9-13 grams of sodium chloride. Additional 5 per cent dextrose in distilled water is given up to a total daily fluid intake of 2500 cc. to 3000 cc. The caloric value of this regime is approximately 600 calories per day and can be increased by the use of hypertonic glucose solutions.

Atelectasis. Immediately following operation the anesthetist should make certain that the lungs are completely expanded and aerated with oxygen. An airway should be left in if the patient has not completely reacted. An attendant should be present until the patient has recovered from the anesthetic and breathes freely. On return to bed the head should be kept lowered to avoid aspiration of gastric contents if vomiting occurs. Periodic carbon dioxide administration will insure expansion of the lungs. Over-atropinization and excessive morphine administration with inhibition of the cough reflex may cause inspissated mucous plugs with collapse of lung and should be avoided. Bronchoscopic examination should not be delayed too long if bronchial obstruction is suspected.

Urinary Complications. Due to the frequent manipulation and suture of the bladder during gynecological operations urologic symptoms are common. Although usually of minor significance they frequently cause sufficient discomfort to mar an otherwise uneventful convalescence. Inability to void is common following pelvic surgery and occurs almost routinely following anterior colporrhaphy and urethroplasty. Patients should be catheterized every 8 hours if not voiding and more frequently if receiving large amounts of intravenous fluids to avoid overdistention of the bladder and impairment of function. *Furmethide* (10 mgms. t.i.d.) is employed to initiate voiding. Even after spontaneous voiding occurs patients will frequently complain of urgency or frequency. These symptoms are usually due to incomplete emptying of the bladder with residual urine. It is therefore our routine to catheterize all patients after voiding to empty the bladder until the residual urine is below 30 cc. When well trained personnel is available repeated catheterization is preferred to the use of indwelling catheters following vaginal plastic surgery due to the inevitable cystitis which occurs with the latter. Following urethroplasty an indwelling catheter for 4 days postoperatively is routine. Sulfa preparations are usually adequate for the treatment of most cases of cystitis. Penicillin, streptomycin and aureomycin are used when indicated. Frequently in the convalescent period patients will have urgency, frequency and dysuria in the absence of infection. These cases usually respond to antispasmodics such as Tincture of Hyoscyamus.

Thrombosis and Emboli. The treatment of these serious and not infrequent complications of gynecological surgery should begin preoperatively and the problem is chiefly one of prophylaxis. Since most emboli originate in the calf veins, all patients with large varicose veins or history of phlebitis should be carefully examined to determine the advisability of preoperative vein injection or ligation or both. Pressure on the popliteal space with compression of vessels should be avoided by adequate padding and proper stirrups and leg supports during operation. Leg and foot exercises should be begun in the immediate postoperative period. Dangling of the legs over the side of the beds, traditionally a popular exercise to prepare a patient for walking is to be condemned because its chief effect would appear to be compression of the popliteal vessels. Routine daily inspection of the legs by the resident staff is desirable to detect the early signs of phlebitis, tenderness of calf muscles, Homan's sign, superficial reddening and edema. Frequent and periodic movement in bed and deep breathing exercises should be encouraged and supervised. Dehydration, postoperative distention and tight abdominal binders all contribute to the incidence of thrombosis and should be avoided. Low grade temperature, rapid pulse, increased respirations, rapid sedimentation rate in patients who are otherwise doing well surgically should alert the surgeon to suspect phlebitis. When sudden pain in the chest occurs, with signs of shock, associated with cardiac arrhythmias and electrocardiogram and x-ray abnormalities, pulmonary embolization has taken place. The superiority of heparinization vs. vein ligation in the treatment of phlebitis has not been established. No routine treatment is employed on the gynecological service. The method of choice in phlebitis is immediate heparinization with maintenance doses of dicumerol. If embolization has occurred unilateral or bilat-

eral femoral vein ligation is added. Paravertebral block is employed when severe pain and edema are present.

The expectation that early ambulation would eliminate thrombophlebitis has not been fulfilled and recent reports indicate that early ambulation does not appreciably alter the incidence of phlebitis. This is not intended to deprecate the value of early ambulation which is practiced on our wards. Too often early ambulation in practice consists of transferring the patient from bed to a reclining chair where she maintains an uncomfortable, painful, immobile position until returned to bed. By early ambulation we mean helping the patient from bed and assisting her to walk three to four times daily. Most patients will be walking to the bathroom unassisted within 48 hours. The psychological and physical advantages of early ambulation are well known and accepted by the majority of surgeons and require no further discussion here.

Fear is present in all patients prior to surgery. In some it reaches a pathological degree. To some extent the impatient surgeon may be responsible. Even the conscientious physician may unnecessarily frighten the patient by boldly stating that cancer may be present although the possibility is remote, simply in order to overcome any reluctance on the part of the patient to submit to surgery. The sadistic surgeon who threatens all of his patients with cancer potentialities does untold harm. The intensive publicity focused on cancer in general also, unfortunately, has created an almost universal problem of cancerphobia. This harm can only be undone by the humanitarian physician by re-education of the individual patient. In addition to the normal fears, maiming and death, the gynecological patient is especially disturbed because of the sexual aspects of pelvic surgery. We have frequently encountered the following misconceptions: castration or hysterectomy will lead to obesity, loss of libido, defeminization, virilization, rapid onset of old age, etc. These anxieties and fears are frequently not expressed and only become apparent in the postoperative period. It is important that the patient be told simply and clearly exactly what is to be done and what the effects will be. Too often a patient is told that she requires a hysterectomy and later wishes to know why she does not menstruate or conceive. If the patient fears an anesthesia mask, it is wise to employ avertin or intravenous barbiturates so that the patient is asleep when closed inhalation anesthesia is used. As soon as possible postoperatively the patient should be told the diagnosis, prognosis and findings at operation. The psychological effect of a reassuring statement at this time is of great value.

Mild postoperative depressions are common and usually run a benign course which can be appreciably shortened by Dexedrine Sulfate. In elderly patients psychoses associated with degenerative brain changes may appear. In these patients paraldehyde or chloralhydrate for sedation are preferable to barbiturates. These patients as well as those with toxic psychoses are best cared for in conjunction with a psychiatrist. The danger of suicide is always present and separate rooms with protected windows and special nursing care are essential for the proper management.

As early as three days after bilateral oophorectomy there occurs an increased

secretion of gonadotrophic hormone in the urine associated with menopausal symptoms (1). When the latter occur in the immediate postoperative period and are associated with unavoidable postoperative discomfort they are intensified and a symptom pattern may occur which may later be difficult to cure. Immediate use of estrogens postoperatively can effectively inhibit these symptoms. Formerly, we used estrogen implants at operation (2) but equally good results can be obtained by the oral administration of an effective estrogen such as stilbestrol 1 mg. daily for a period of 2 to 3 months.

There are many small details of postoperative care which can contribute greatly to the physical comfort of patients. The following is a brief enumeration of some of the more obvious minutiae of the care which can make or mar the postoperative course.

- a) Adequate relief of pain by narcotics and insurance of a good night's rest with sedatives. Routine dosage orders of these drugs frequently is not adequate and the dosage must be individualized.
- b) Regulation of bowel elimination by laxatives and enemata. To many patients the first bowel movement is a minor triumph and indicates a return to normality. We usually employ Milk of Magnesia and mineral oil for a laxative but here also individualization and acquiescence to the patient's wishes if she is accustomed to some proprietary medication is worthwhile. S.S. enemata are routine when required. Oil retention enemas following vaginal plastics are frequently more comfortable in patients who have had obstipation for several days.
- c) Pitcher douches are employed in all vaginal plastic cases following voiding and defecation. These consist of a thorough soaping of the external genitalia followed by pitcher lavage to remove the excess soap.
- d) Anesthetic ointments such as nupercaine together with saline compresses and heating lamps are helpful in relieving postoperative perineal discomfort. Sitz baths after the 7th day postoperative are also useful for this purpose.
- e) The malodorous, purulent vaginal discharge due to necrosis of tissue along suture lines can be greatly diminished by daily use of penicillin vaginal suppositories.
- f) The time honored use of tonics such as Iron, Quinine and Strychnine has fallen into disrepute because of their ineffectiveness. However the use of vitamins and potent iron preparations have great psychological value and are definitely worthwhile.

There is no exact information available on the question of when is the optimum time for the return of a patient recovering from major surgery to normal activity. Economic considerations and the shortage of hospital beds have necessitated a decrease of postoperative hospitalization to 7-10 days. It is true that the patient no longer requires hospital care but few physicians would contend that she is ready for normal activity. All would agree that further convalescence is important and essential. Older surgeons recognized this need as witnessed by their writings in the early textbooks where they sternly recommended cruises

and sojourns in European Spas and the Riviera. Unfortunately the majority of ward patients must return to the care of a large family and immediately resume the household burdens and responsibilities, psychologically and physically unprepared.

Our service at The Mount Sinai Hospital has been particularly fortunate in having available the facilities of the Neustadter Home for the convalescence of our patients. We are firmly convinced of the necessity and great value of this postoperative period and all patients are advised and encouraged to utilize the Neustadter home for this purpose. It is recommended, not simply as a vacation but as an important medical factor to insure a complete recovery.

Postoperative Regimen. A list of routine orders for postoperative care as practiced at The Mount Sinai Hospital is appended in the hope that it will provide useful information to those who are to take over the care of the patient during the more advanced phase of convalescence.

A. *Vaginal Plastics and Vulvectomies:*

1. Out of bed first p.o. day.
2. T.P.R. q. 4 h. orally.
3. Fluid and diet as tolerated.
4. I.V. of alternating solutions 5% glucose in saline, and 5% glucose in distilled water to 3000 cc daily until patient takes fluids by mouth.
5. Chart total intake and output.
6. Turn frequently.
7. Leg exercises b.i.d.
8. CO₂ and O₂ inhalations q. 2 h. for 48 hours.
9. Furmethide 10 mg t.i.d. till patients void and residual is below 100 cc.
10. Catheterize q. 8 h. p.r.n. When patients start to void catheterize b.i.d. for residual until it is below 30 cc.
11. If patient has an indwelling catheter chart drainage q.i.d. Catheter is removed on the 3-5 day.
12. Magendie minims 6 q. 4h p.r.n. for 48-72 hours for pain. Then codeine gr. 1 q. 4 h. p.r.n.
13. Perineal care—picheur douche of sterile saline or water after each bowel movement or after urinating. If patient is not voiding or having b.m. for several days perineal care is given b.i.d.
14. Heat lamp to perineum b.i.d. starting on the 3-5 p.o. day; especially if perineum looks moist and macerated.
15. Sitzbaths t.i.d. starting on the 3-5 day if there is any duration or separation of the perineal or vaginal wounds.
16. Procaine penicillin aqueous 300,000 units q.a.m. when indicated.
17. Packings are removed on the 3rd p.o. day.
18. S.S.E. on 3rd p.o. day. Then milk of mag. and mineral oil ̄ā oz. ½ q.n. if patient does not have a bowel movement.
19. Milk of mag. and mineral oil aa oz. ½ q.n. after 3rd p.o. day if patient does not have a bowel movement.
20. Seconal gr. 1½ hs p.r.n.
21. Fergon tabs 2 t.i.d. if hemoglobin is below 11 grams (2 cc. Solu B and 100 mg. vitamin C given in I.V. b.i.d.

B. *Abdominal Operations:*

1. Out of bed 1st p.o. day.
2. T.P.R. q. 4h rectally.

3. Fluids and diet as tolerated.
4. I.V. of alternating solutions 5% glucose in saline and 5% glucose in distilled water to 3000 cc. daily until patients take fluids p.o. (usually 24-36 hours)
5. Chart total intake and output.
6. Turn frequently.
7. Leg exercises b.i.d.
8. CO₂ and O₂ inhalations q. 2 h. for 48 hours.
9. Furmethide 10 mgm. t.i.d. until patient voids.
10. Catheterize q. 9-10 h. p.r.n.
11. Magendie minims 6 q. 4 h. p.r.n. for pain for 48-72 hrs. and then codeine gr. 1 q. 4 h. p.r.n.
12. Penicillin procaine aqueous, 200,000 units q.d., streptomycin gms. $\frac{1}{2}$ q. 4h, or sulfadiazine grams 1 q. 4 h.; aureomycin 250 mgm. q. 6 h. as indicated.
13. Packings on total hysterectomies are removed on 1st p.o. day.
14. S.S.E. on 3rd p.o. day.
15. Milk of mag. and mineral oil aa $\frac{1}{2}$ oz. q.n. after 3rd p.o. day if patient does not have bowel movements.
16. Dressed on 5th p.o. day, and clips and sutures removed.
17. Seconal gr. $1\frac{1}{2}$ hs q.n., p.r.n.
18. Fergon tabs 2 t.i.d. if hemoglobin is below 11 grams.
19. Vitamins as above.
20. Phenobarbital gr $\frac{1}{2}$ t.i.d.
21. Pyridoxine 50-100 mg. I M and/or Dramamine 50 mg. are given for excessive p.o. nausea.

C. *Rectovaginal Fistula:*

1. In bed. Out of bed on 1st p.o. day.
2. T.P.R. q. 4 h. orally.
3. Chart total intake and output.
4. Low residue diet as tolerated.
5. Furmethide 10 mgm. t.i.d. until patients void.
6. Catheterize q. 8-10 h. p.r.n.
7. Turn frequently.
8. Leg exercises b.i.d.
9. CO₂ and O₂ inhalations q. 2 h. for 48 hours.
10. Magendie minims 6 q. 4 h. for pain p.r.n. for 48-72 hours, then codeine gr 1 q. 4 h. p.r.n.
11. Seconal gr $1\frac{1}{2}$ hs p.r.n. q. n. hs.
12. D.T.O. minims 10 t.i.d. for 5. days.
13. Oral streptomycin grams $\frac{1}{2}$ q. 6 h. for 72 hours.
14. Sulfathaladine grams 2 q.i.d. or sulfasuxidine grams 4 q.i.d. for 6 days.
15. Aqueous procaine penicillin 300,000 units qd 5-7 days.
16. Fleet's phospho-soda 2 tsp. q. 4 h. until bowels move on 6th p.o. day.
17. Milk mag. and mineral oil aa oz $\frac{1}{2}$ q. n. p.r.n. after 7th p.o. day.
18. Fergon tabs 2 t.i.d. if hemoglobin is below 11 grams.
19. Hexavitamins tabs 2 t.i.d.
20. Perineal care—pitcher douches of sterile saline or water after each bowel movement.
21. Perineal lamp b.i.d. if perineal wound seems indurated.
22. Sitzbaths t.i.d. after 7th p.o. day if wound is slightly indurated or separated.

D. *Vesicovaginal Fistula:*

1. In bed until catheter is removed.
2. T.P.R. q. 4h rectally.
3. Attach catheter to bedside bottle and measure output q.i.d.
4. Chart total intake and output.
5. Fluids and diet as tolerated.

6. Magendie minims 6 q. 4 h. p.r.n. for pain for 48-72 hours. Then codeine gr 1 q. 4h p.r.n. or codeine and aspirin suppositories q. 4 h. p.r.n.
7. Turn frequently.
8. Leg exercises.
9. CO₂ and O₂ inhalations q. 2 h. for 48 hours.
10. Penicillin aqueous procaine 300,000 units q. d.
11. Sulfadiazine grams $\frac{1}{2}$ q 6 h.
12. Soda bicarb. grains 30 q. 6 h.
13. Catheter removed on 10-14 p.o. day.
14. Catheterize q. 6-8 h. p.r.n. after catheter is removed until residual is below 30 cc.
15. Furmethide 10 mgms. t.i.d. after catheter is removed until residual is below 30 cc.
16. Fergon tabs 2 t.i.d. and hexavitamins tabs 2 t.i.d.
17. Seconal gr $\frac{1}{2}$ h.s. p.r.n.
18. Phenobarbital gr $\frac{1}{2}$ t.i.d.

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THE CONVALESCENT CARE OF POST-OPERATIVE NEUROSURGICAL PATIENTS*

IRA COHEN, M.D.

In no group of cases is convalescent care of more importance to the patient than in the post-operative neurological group. In no group is it more important to the institution giving such care to distinguish between the convalescent patient and one in need of custodial care.

In the former we recognize one who is in need of, and will benefit by, additional attention to the extent of returning to a normal or at least a modified normal life. The latter group is just as much in need of attention directed toward the comfort of the affected person although without hope of physical improvement.

It is not entirely chance that at a time when hospital beds are at a premium the practice of early post operative ambulation is spreading. While such practice relieves the hospital at an earlier date of a post-operative bed encumbant, it does not promote a proportionately earlier "Return to full duty" of the patient. In passing it could be pointed out that the present day household, whether rich or poor, is not nearly as adequately staffed to cater to a convalescent as was that of our grandparents.

The convalescent care of the neurosurgical patient may well be considered from three aspects:

- 1) The general post-operative point of view.
- 2) The restoration of function, by reeducation.
- 3) The probable occurrence of convulsive seizures.

1: From the general post-operative viewpoint the neurosurgical patient differs but little from the general surgical patient. His operation may or may not have taken its toll of his general strength. In the absence of infection and with the present day methods of prevention of shock, even the lengthy procedures of a neurosurgical operation do not greatly disturb many of such patients.

The psychiatric aspect will, no doubt, be covered in greater detail elsewhere. From this point of view the patient more closely falls into the general surgical group who have had what is technically referred to as mutilation. The reason for this is the fact that the nervous system, especially the brain, having been subjected to a surgical attack, leaves many a patient in a state of fear of what the future may hold for the proper functioning of the brain or dependent parts of the body. It is in the sympathetic understanding of the staff of the institution for convalescents as well as from the association with convalescents rather than early post-operative patients that confidence will be restored to neurosurgical cases.

2: Restoration of function. These words bring to mind immediately the training of the "halt to walk". There is conjured up the much (and deservedly) well advertised efforts in the rehabilitation of the war and poliomyelitis paralytics. The neurosurgical patient may have weakness of one or more extremities as a

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result of the disease or of the surgeon's effort to eradicate it. He, therefore, belongs in the aforementioned group. The post-operative brain case in some instances has lost more or less of his ability to speak. Such a person is in need of reeducation. A beginning of reeducation for loss of speech or power in the extremity has, without doubt, been made at the "Acute" hospital. For whatever reason convalescent care is often begun before a satisfactory reeducation has been obtained. In the event that during the stay at a convalescent home reeducation lapses there may well be some loss of the advances made.

It follows, therefore, that it is desirable, if not actually necessary, for one of the staff to be capable of continuing the reeducation during the patient's convalescent stay.

3: The third point in the care of a post-operative neurosurgical case is the recognition that one who has had an operation upon the brain may have convulsions as a residuum of his disease or the operation. Where in the opinion of the surgeon such a possibility exists, the patient is apprised of it and is provided with anticonvulsant medication. The staff of the convalescent institution should also realize the possibility of such a happening, they should be able to reassure the patient and his fellow convalescents. The existence of the possibility of a convulsion should not act as a bar to the admission of such patient to the institution.

It is factors such as these that make it so advantageous for the convalescent hospital to be an intimate part of the acute hospital. The patient is passed upon as suitable for convalescent care by a physician who has ample opportunity to study the patient in the acute hospital. The physicians who originally cared for the patient can always be consulted. This truly makes for continuity in care.

CONVALESCENT CARE IN GENITO-URINARY SURGERY

GORDON D. OPPENHEIMER, M.D. AND LESTER NARINS, M.D.

Adequate care of the patient convalescing from surgery of the genito-urinary tract frequently requires specialized knowledge and management. Therefore it may be helpful to outline a few specific instances.

PROSTATIC SURGERY

A. Benign Disease. The average post-prostatectomy patient requires little attention aside from proper dietary management and the maintenance of urinary antiseptics. Most patients are ready for discharge from the hospital on the 10th post-operative day whether the procedure be performed by transurethral resection, one stage suprapubic prostatectomy or retropubic prostatectomy. In perineal prostatectomy, the post-operative period is somewhat longer than in the other procedures. Following discharge from the hospital, the patient requires careful watching lest delayed bleeding appear from the prostatic bed; such an eventuality demands his prompt return to the hospital.

Since most patients with prostatic disease are in the older age groups they often manifest signs and symptoms of cardiac, pulmonary, diabetic or hypertensive disease and are in need of careful medical management. There are also some patients who for various reasons require a preliminary suprapubic cystostomy which may cause a long delay before prostatectomy is performed. These patients suffer either from severe cardiac or pulmonary disease or greatly reduced renal function resulting from long standing prostatic obstruction. As they may require suprapubic drainage for many months, constant urinary antiseptics will be necessary. The suprapubic tube should be irrigated at least once daily, and, if worn for several months, should be changed every 6 weeks by the urologist. When, as commonly occurs, the urine is heavily infected with urea splitting organisms and is strongly alkaline, irrigations with Suby's solution* should prevent incrustations. Urinary acidifying drugs are indicated but should be used cautiously to avoid development of acidosis. Following a varying period of careful observation, these patients are prepared for prostatic surgery. In the rare instance, a patient may be compelled to wear a suprapubic tube for the remainder of his life.

B. Malignant Disease. Radical perineal prostatectomy is indicated when carcinoma of the prostate is deemed operable.

With the use of hormonal therapy in prostatic malignancy, patients with this disease have undoubtedly been made more comfortable. The question of whether or not life is prolonged with any of the current palliative measures has not been definitely established, but they unquestionably mitigate the problems of convalescence. When prostatic cancer is diagnosed by rectal palpation, the disease is usually too far advanced for radical perineal prostatectomy. The common

* Suby's solution—Citric Acid, 32.3 gms. Magnesium Oxide, 3.8 Gms. Sodium Carbonate, 4.4 Gm. Distilled Water q.s. ad. 1000.0 c. c.

methods now in use include estrogenic hormone therapy, orchiectomy and trans-urethral resection. Following either, or both, of the latter comparatively minor procedures, the patient offers few convalescent problems. The administration of estrogenic hormones must be individualized and the dosage determined by the patient's tolerance. Therapy should be promptly discontinued when reactions such as nausea, gynecomastia, gynecodynia or diarrhea appear. Should the patient "escape" from hormonal control, and evidence of metastases and urinary obstruction set in, he becomes a candidate for a chronic diseases institution.

RENAL SURGERY

Convalescence from simple nephrectomy requires little more than routine care. The wound should be dressed every few days, washed with alcohol or ether, fresh dressings being applied. Nephrectomy for carcinoma does not significantly affect the nature of early convalescent care. In the instances where the patient is required to wear either a unilateral or, in occasional instances, bilateral nephrostomy tubes, management becomes more complicated and the constant supervision of the urologist is essential. Measures to combat infection include the use of mandelamine, sulfonamides, penicillin, streptomycin, aureomycin, and chloromycetin, or their combinations. Incrustations can be prevented by daily irrigation of the nephrostomy tubes with sterile water, saline or Suby's solution. Irrigation should be performed with the glass part of a Dakin syringe and only gravity pressure should be used as greater pressure entails considerable risk.

BLADDER SURGERY

Patients who undergo endoscopic treatment for bladder lesions are rarely in need of specific convalescent attention.

Those with partial cystectomy for bladder neoplasm may experience severe frequency and dysuria. Such symptoms require the attention of the urologist but can, in large measure, be controlled with sedatives, antispasmodics and urinary antiseptics.

An increasing number of total cystectomies and ureteral transplants are performed for the removal of bladder carcinomata. Such formidable procedures may create challenging problems during convalescence. Of primary importance is the maintenance of a satisfactory nutritional state. Patients with skin ureterostomies require the urologist's care in the hospital. Patients with uretero-sigmoid anastomoses present fewer problems. Complicating pyelonephritis can be prevented by the persistent, at times intermittent, use of bowel or urinary antiseptics. Severe rectal frequency and rectal burning or tenesmus require sedation and will usually abate when the mucosa becomes tolerant to the presence of urine. Patients with uretero-sigmoid anastomoses should be periodically checked with excretory urograms and watched for the possible development of local metastases.

The proper management of the post-operative urological patient demands close co-operation between the urologist and the physician in charge of convalescent care. In most instances convalescence requires little more than the care incident to surgery and advanced age. When special problems arise, early consultation with the urologist is essential.

THE MOUNT SINAI HOSPITAL CONFERENCES ON CONGENITAL HEART DISEASE*

I. EISENMENGER'S COMPLEX WITH DEFECTIVE INTERATRIAL SEPTUM

Edited by

SAUL JARCHO, M.D.

This is the first of a series of conferences to be recorded periodically in this Journal. In the present case the initial studies were made by Drs. Frederick H. King, Alvin J. Gordon, E. R. Borum, and Richard P. Lasser.

Richard P. Lasser, M.D.: The patient was a 5-year-old white girl observed on the service of Dr. Horace Hodes. She was not noted to be cyanotic at birth, but following two episodes of pneumonia at 7 months of age, mild cyanosis was noted. The diagnosis of congenital heart disease was made at that time. Since then the cyanosis appeared to become increasingly intense, particularly after crying or during very limited amounts of exercise. Her appetite was poor and development subnormal. There were repeated respiratory infections. During the past two years the child experienced four syncopal attacks, one of which was severe, the child being unconscious for 5 minutes.

The child was small and quiet. There was moderate cyanosis of the lips, mucous membranes and extremities, and early clubbing of fingers and toes. No thrills were palpable over the precordium but a diastolic shock could be felt in the second interspace at the left sternal border. The heart was not enlarged to percussion. A rough, moderately loud (Grade 3) systolic murmur was heard maximally at the left sternal border in the 3rd intercostal space. The murmur was transmitted both upward and downward along the left sternal border and could be heard faintly over the carotid arteries. The second sound at the base of the heart was split. The second pulmonic sound was very loud and snapping. The remainder of the physical examination was within normal limits.

The hemoglobin was 18 Gm., venous pressure was 10.5 cm. of water. The ether circulation time (arm to lung) was 3.5 seconds.

The electrocardiogram, which is shown in Figure 1, is characteristic of right ventricular hypertrophy. There is marked right axis deviation in the standard leads. The RS-T segments of leads II and III are depressed. A small q and tall R wave are seen in unipolar leads from the entire right side of the chest. The leads taken around the left side of the chest show small r, deep S complexes.

On fluoroscopic examination the heart did not appear to be enlarged in its transverse diameter. The most prominent feature was marked enlargement of the main pulmonary artery. Both right and left pulmonary arteries were also much enlarged. The intrapulmonic vascular markings, however, were within normal limits. There was no excessive pulsation of hilar vessels. In the right anterior oblique position, the anterior contour of the heart was seen to encroach

* Cases illustrating various aspects of congenital heart disease are selected from material presented at the semi-monthly conferences of the Congenital Heart Disease Clinic of The Mount Sinai Hospital.

upon the retrosternal space, indicating a moderate degree of right ventricular hypertrophy.

This young patient presented the problem of the differential diagnosis of congenital heart disease manifesting increasing cyanosis and syncopal attacks. The cardiac murmur, which was not distinctive, the electrocardiogram which showed evidence of marked right ventricular hypertrophy, and the large, poorly pulsatile main pulmonary artery did not contribute to the solution of the paramount problem, which was whether or not pulmonic stenosis was present. Therefore cardiac catheterization was undertaken.

The child was prepared for the procedure with pentothal and avertin administered rectally. The right saphenous vein was isolated at a point just below

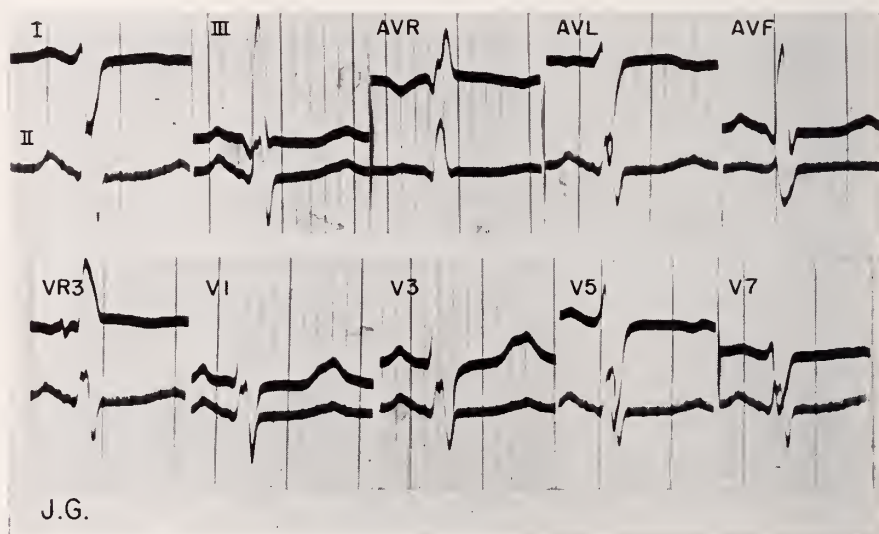


FIG. 1. Electrocardiogram showing marked right axis deviation, a tall, notched R wave in AVR and complexes consisting of tall R, small s waves in right precordial leads, and small r, deep S waves in left-sided precordial leads. The electrocardiogram is taken at high speed. The reference lead is lead II, and is always the lower tracing of each pair.

its entrance into the femoral vein. A #6 bird's eye catheter was inserted and passed up into the heart. The catheter passed immediately through an atrial septal defect and into a left pulmonary vein. A spot film taken at that site is shown in Figure 2a. The catheter was withdrawn into the left atrium and then advanced into the left ventricle. A spot film of this is shown in Figure 2b. The right ventricle and main pulmonary artery were then entered in succession, and a continuous tracing was obtained as the tip of the catheter was withdrawn from the pulmonary artery into the right ventricle. Spot films of the catheter in these locations are shown in Figures 2c and 2d. A Cournand needle was placed into the left femoral artery and simultaneous tracings were taken from left femoral artery and right ventricle. Evans blue (3 cc.) was injected into the right ventricle, and the circulation time from the ventricle to the ear was measured with the

Millikan oximeter. This proved to be 3.5 seconds. It represented the time consumed from the beginning of injection to the first deflection of the galvanometer which signalled the arrival of the dye in the blood vessels of the ear. In normal children of this age, the circulation time so measured is 5.5 seconds or more. The shortened right ventricle-to-ear circulation time indicated an overriding aorta.

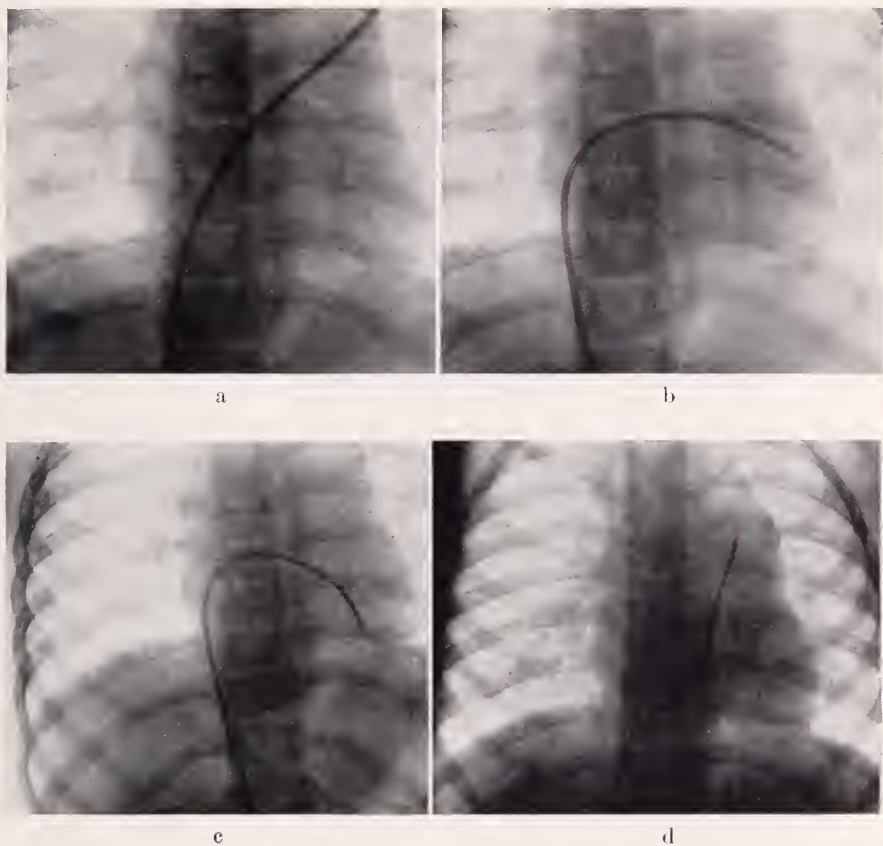


FIG. 2. a) Spot film showing the catheter lying in the lung field in a pulmonary vein after traversing the right and left atria.
b) Spot film showing the catheter in the left ventricle.
c) Spot film of the catheter in the right ventricle.
d) Spot film of the catheter in the main pulmonary artery.

The pressures and results of the blood-gas analysis are shown in Table I. It can be seen that the systolic pressures in the systemic and pulmonary circuits are almost identical, indicating that the two ventricles operate as a single pressure unit. The high systolic pressures in the main pulmonary artery, of course, eliminate any possibility of pulmonic stenosis. The mean pressures obtained in the atria and the diastolic ventricular pressures are within normal limits. Tracings of the pulse pressures are shown in Figure 3. Blood-gas analysis,

as can be seen, shows normal oxygen saturation in the pulmonary vein and marked arterial unsaturation in the femoral artery. The fact that the oxygen content in the left atrium and ventricle are the same, and are somewhat lower than that observed in the pulmonary vein, indicates that a small right-to-left

TABLE I

SITE	PRESSURE	O ₂ CONTENT	PER CENT SATURATION
P.V.	2 mm Hg.	23.08	92.3
L.A.	3 mm.	22.62	90.47
L.V.	72/2	22.71	90.8
S.V.C.		15.98	64.37
I.V.C.		13.48	54.23
R.A.		17.04	68.66
R.V.	67/1.5	17.4	70.0
M.P.A.	72/46	17.51	70.53
Fem. Art.	77/60	17.4	70.0

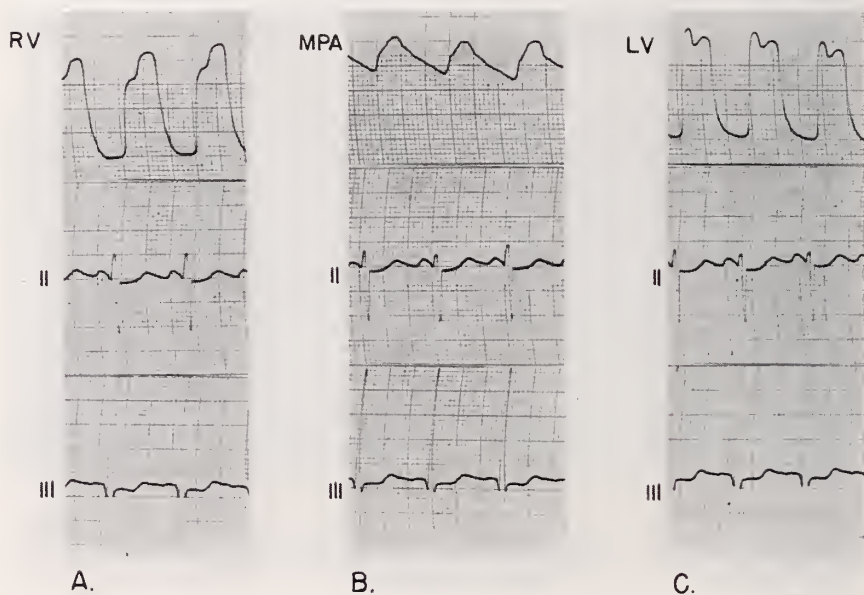


FIG. 3. A) Pressure tracings within the right ventricle.
 B) Pressure tracings within the main pulmonary artery.
 C) Pressure tracings within the left ventricle.
 The systolic pressure in all these locations is almost identical.

shunt may exist between the atria; but this is not sufficient to account for the peripheral arterial unsaturation. No venous-arterial shunt is present between the ventricles. The oxygen content in the right atrium is substantially higher than that in both venae cavae. Therefore, a large quantity of arterialized blood must be entering the right atrium from the left. The oxygen content in the right

ventricle and pulmonary artery is similar to that in the right atrium. The oxygen content in the femoral artery is almost identical with that observed in the right ventricle, indicating that a large proportion of the systemic flow is derived from the right ventricle. This probably means that the aorta arises in large measure from the right ventricle, and that communication between left ventricle and aorta is difficult. As has been stated, apparently no shunt of blood takes place through the interventricular septal defect. At the conclusion of the catheterization an attempt was made to anesthetize the child with ether pre-



FIG. 4. X-ray of the chest showing some rounding and elevation of the apex, marked prominence of the pulmonary artery, and normal intrapulmonic vascular markings.

paratory to angiocardiography. She became very cyanotic, and the procedure was abandoned.

The conclusion drawn from the cardiac catheterization was that the patient probably had Eisenmenger's complex with interatrial septal defect.

Sigmund Brahms, M.D.: In the roentgen films the heart is approximately normal in size. There is no obvious enlargement of the right ventricle as indicated in the right anterior oblique view. The aortic knob is normal. In general the pulmonary vascular markings are normal. There is some rounding and elevation

of the left ventricular apical region (fig. 4). The pulmonary artery segment is convex in the postero-anterior and right anterior oblique positions. In a cyanotic child—on the basis of the conventional films—I would suspect: first, Eisenmenger's complex, and then tetralogy of Fallot with post-stenotic dilatation of the pulmonary artery, though I think that would be less likely.

Alvin J. Gordon, M.D.: It is surprising how often the catheter unexpectedly penetrates into the left atrium, especially when it is passed from below. In our series there has been no autopsy in a case of this kind, hence we cannot say how large the defect is. In this instance there is evidence of shunt from right to left and also from left to right. In other cases the oxygen figures indicate that the communication between the atria is of no functional significance.

Frederick H. King, M.D.: The cause of cyanosis in Eisenmenger's complex is an interesting question. There is, of course, a shunt of blood from right to left into the aorta, but this contribution of reduced hemoglobin to the general circulation of itself is said to be insufficient to cause cyanosis. Some attribute the cyanosis in part, at least, to an abnormality of the pulmonary capillaries, present in some cases of Eisenmenger's complex. The right to left shunt due to the over-riding aorta must, however, be the prominent factor, since the pathologic pulmonary findings are not constantly present.

Dr. Gordon: Dr. King has already commented on the hypothesis that the cyanosis in Eisenmenger's complex is a result of some abnormality in the pulmonary epithelium, resulting in deficient respiratory gas exchange. This idea arose for several reasons: 1. The volume of the right to left shunt into the aorta was thought to be too small to lead to cyanosis; 2. The circulation to the lungs is usually adequate; 3. Pulmonary arteriolar sclerosis is known to occur in some of these cases; 4. Cyanosis may not develop until late childhood or early adult life, presumably after these hypothetical changes in the pulmonary epithelium have occurred.

This case is unique in that the added interatrial septal defect permitted sampling of blood in the pulmonary vein and left atrium. Although the oxygen saturation of pulmonary vein blood is slightly lower than normal, it is high enough to exclude a significant alveolo-respiratory component in the genesis of the cyanosis.

Dr. King: A recent review by Drs. Arthur Selzer and G. L. Laquer supports the belief that the cyanosis in Eisenmenger's complex is due entirely to the shunt.

ABSTRACTS

AUTHORS' ABSTRACTS OF PAPERS PUBLISHED ELSEWHERE BY MEMBERS OF THE MOUNT SINAI HOSPITAL STAFF

Members of the hospital staff and the out patient department of the Mount Sinai Hospital are invited to submit for publication in this column brief abstracts of their articles appearing in other journals.

The Management of Anuria in Acute Mercurial Intoxication. A. P. FISHMAN, I. G. KROOP, H. E. LEITER AND A. HYMAN. New York State J. Med., 48: 2393, November, 1948.

The case history of a patient with acute mercury intoxication is presented to illustrate the principles that have been found effective in aiding the recovery from reversible anuria. For contrast, a similar case of anuria, treated with the Kolff Artificial Kidney is briefly presented. The tendency to spontaneous resolution of the anuria is stressed as well as the anticipated time of its occurrence. The dangers of overtreatment are emphasized. Because of the reversible nature of the kidney lesions, caution is advised in ascribing resolution of acute anuria to artificial methods of treatment.

Cervicomediastinal and Mediastinal Cystic Hygromas. R. E. GROSS AND E. S. HURWITT. Surg., Gynec., & Obst., 87: 599, November, 1948.

The clinical and laboratory findings in these lesions are reviewed. The successful management of 2 cervicomediastinal and 1 mediastinal cystic hygroma is reported. The cervical portions of hygromas are best treated by a meticulous dissection and removal of the cystic portions. Whenever possible, treatment of the thoracic lesions is preferably done by complete extirpation of the presenting mass. Under some circumstances, a cervicothoracic hygroma can be treated by surgical excision of the cervical portion and transcervical approach to the intrathoracic portion, the latter being treated by intense chemical sclerosis followed by external drainage. If such therapy is followed by persistence or recurrence of the intrathoracic component, thoracotomy for excision of the remaining hygroma is indicated.

Preliminary Observations on the Use of Human Arterial Grafts in the Treatment of Certain Cardiovascular Defects. GROSS, R. E., HURWITT, E. S., BILL, A. H., JR., AND PEIRCE, E. C., 2ND. New England J. Med., 239: 578, October, 1948.

Observations were made on the grafting of segments of fresh and preserved arteries from 1 dog to another. A satisfactory preservation technique was developed. Segments of human arteries, obtained from postmortem material under rigidly controlled conditions, were successfully interposed as shunts between the arterial system and the pulmonary artery in 9 cases of Tetralogy of Fallot. Preserved transplants were also interposed between the divided ends of the thoracic aorta in 3 cases of coarctation of the aorta.

Results of Treatment of Perforation of the Esophagus. E. E. JEMERIN. Ann. Surg., 128: 971, November, 1948.

The results obtained in 69 cases of perforation of the esophagus by foreign bodies, instrumentation, or both, covering the period from 1925-1947, are presented. The gross mortality was 36.2%. The cause of death in almost all cases was mediastinal infection. When listed chronologically, a marked improvement in results with the passage of years was apparent. Prior to 1936, the mortality was 77.3%; since 1936, only 17%. Further breakdown

into operative and non-operative cases shows the improvement to parallel an increase in surgical intervention. Prior to 1936, only 50% of the cases were treated surgically, whereas since 1936, 89.4% were treated surgically. For the entire series, both before and after 1936, the operative mortality was 26.4%, as compared to 68.7% for those not operated upon. Operation alone, however, does not tell the whole story, as indicated by an operative mortality of 72.7% before 1936, as compared to 14.3% since. To be most effective, surgery must be prompt. Ideally, operation should be performed immediately upon recognition of the existence of a traumatic laceration of the esophagus, and certainly before infection has descended into, or become full blown, in the mediastinum. Prior to 1936, only 3 of 11 surgically treated cases were operated upon less than 1 week after perforation. Since 1936, 35 of 42 cases were operated upon within the first week, and in 2 of them operation was performed within 2 days of the injury. The marked improvement in the mortality, accordingly, is to be attributed not only to the recognition of esophageal perforation as a surgical lesion, but to the necessity of treating it as a surgical emergency and operating as promptly as possible. Actually, with prompt surgical intervention, mortality from esophageal perforation should be rare, occurring only in unpreventable situations, such as a fulminating infection following extensive laceration of the esophagus, serious complicating lesions, or a patient admitted with a very widespread infection long after perforation. Penicillin and the other chemotherapeutic agents should be used only as an adjunct to prompt surgery. While a few of our cases recovered with penicillin therapy alone, in most, deterioration and spread of infection continued despite the administration of the antibiotic. This resulted in a death in 1 case, a near death in a second, and in many cases in the loss of valuable time as the lesion continued to develop despite penicillin.

Electron Histology of the Heart. B. KISCH. Exp. Med. & Surg. 6: 346, November, 1948.

Diaphragm, heart muscle (ventricle), and a false chorda tendinea referred to as "Purkinje fibre" of a child's heart were investigated by means of the electron microscope and high speed microtome. In the "Purkinje fibre" a tight network of straight connective tissue fibres was found. Only a part of these fibres, present in large quantities in sections of the diaphragm and a few in the Purkinje fibre, show a dark central column in a light sheath and segmentation due to dark parallel strips crossing the entire fibre at distances of 600-675 Å from each other. The central column in a light sheath may be a kind of Fresnel fringe effect due to astigmatism of the lens. The diameter of the connective tissue fibres is 300-500 Å, that of the dark central column if present, is about $\frac{1}{2}$ of this amount. A part of the fine fibres shows no segmentation nor other structures. In some instances a part of one and the same fibre appears segmented, a part unsegmented. The dark segmentation resembles the appearance of Liesegang's rhythmic precipitation in colloids. The spacing of the segments equals that found by Schmitt et al by means of electron microscopy and by Baer in X-ray diffraction studies, in collagen fibrils. In the "Purkinje fibre" and the heart muscle, long dark muscle fibres were found, composed of bundles of thinner elementary fibres. The muscle fibres of the ventricle separate into much thinner fibres of a diameter of about 300 Å. Some of them show segmentation; the distance of those segments measures only 500 Å or less. The elementary fibres of ventricle muscle but not those of the "Purkinje fibre" formed at places, a network either at the end of one or linking together 2 thicker fibres. In the slices of the ventricle, connective tissue fibres were found much more sparingly than in slices of diaphragm and of the "Purkinje fibre". To date, the author did not find in ventricle tissue the segmented type of connective tissue fibre. Whether the straight fibres in the "Purkinje fibre" are really conductive tissue or not, cannot be decided without further investigations, because it is known that some of the false chordae contain no conductive tissue.

A "Cross-Fibre Effect" in Electron Microscopy. B. KISCH. Exper. Med. & Surg., 6: 366, November, 1948.

The optical effect of electronic refraction in pictures taken with an electron microscope is described and can be found, wherever 2 fibres cross each other.

Occlusion of the Central Retinal Artery. A Clinicopathologic Study. A. L. KORNZWEIG. *Am. J. Ophthalm.*, 31: 1421, November, 1948.

A case of occlusion of the central retinal artery of the right eye in a woman, aged 72 years, is presented. It came on suddenly with no premonitory symptoms. She suffered, in addition, from essential hypertension of moderately severe degree. The patient was followed clinically for over two years with no improvement in the eye condition. At her death, the eyes were examined pathologically. No evidence of embolus, thrombus formation, or endarteritis was found. Advanced arteriosclerosis was present in the choroidal and central retinal arteries. Spasm is considered as contributing to the occlusion of the central retinal artery.

Plastic Oral Surgery: A New Term. M. J. ORINGER. *N. Y. J. Dent.*, 18: 345, November, 1948.

Nomenclature commonly used to describe many oral surgical procedures is not self-explanatory, and therefor is not adequately evaluated. Surgical alteration of the shape and structure of the hard and soft tissues of the body for either functional correction or cosmetic improvement, is properly termed "Plastic Surgery" by the medical profession. The oral surgeon frequently resorts to surgical reconstruction and alteration of oral hard and soft tissues to effect functional correction or cosmetic improvement. These operations, based upon sound plastic surgery technique, often involve use of skin grafts, tissue flaps, bone and metal grafts, etc.. Nomenclature like alveolectomy, submucous resection and mandibular resection may be scientifically correct, but is not descriptive. The term "Plastic Oral Surgery", being aptly descriptive and self-explanatory, would attain suitable recognition for these specialized services.

Acute Coronary Thrombosis Occurring in Case of Perforating Lesser Curvature Ulcer, Undergoing Malignant Changes. E. M. SACHS. *Am. J. Digest. Dis.*, 15: 375, November, 1948.

Acute coronary occlusion has many times been mistaken for an abdominal catastrophe and conversely, symptoms due to abdominal conditions may simulate those of a cardiac accident. Diagnosis may be even more difficult if in a case of penetrating ulcer with active symptoms, coronary thrombosis supervenes. In such an instance one might erroneously attribute the entire symptom complex to an acute perforation and overlook the coronary thrombosis.

The following points of interest which pertain to this case may be summed up as follows:

1. A gastric ulcer may persist for some time without any demonstrable X-ray evidence.
2. When coronary thrombosis occurs in a case of a chronic penetrating lesser curvature ulcer during the stage of an acute exacerbation, diagnosis may be difficult. Electrocardiographic studies should be included along with gastrointestinal studies.
3. In the presence of an increase in the size of a niche the diagnosis of malignancy must be considered and surgery instituted.
4. The occurrence of coronary occlusion with myocardial changes appears to be no contra-indication to major surgery, in the absence of cardiac failure when a reasonable period of time is permitted to elapse.

The Use of Streptomycin in the Cultivation of Endameba Histolytica from Stools. C. L. SPINGARN, AND M. H. EDELMAN. *Am. J. Trop. Med.*, 28: 825, November, 1948.

The use of streptomycin in doses varying from 1.0 to 10.0 mgms. per ml. of serum-saline overlay increased the percentage of positive cultures of trophozoites obtained from stools containing cysts of *E. histolytica* from 8 per cent in the controls to 73 per cent. The use of the drug produced varying degrees of bacterial inhibition, retarded the decomposition of rice starch, and suppressed *B. hominis*.

Wenckebach Periods in Sino Auricular Block. B. KISCH. *J. Exper. Med. & Surg.* 6: 447, November, 1948.

Tracings are presented of a S-A and A-V block in a fish heart. The sino-auricular block is of the progredient type of Wenckebach periods.

A Reinvestigation of Flavacidin, the Penicillin Produced by Aspergillus Flavus. M. ADLER AND O. WINTERSTEINER. J. Biol. Chem., 176: 873, November, 1948.

The antibiotic produced by *Aspergillus flavus*, grown in submerged culture on a medium containing steep liquor and lactose, consists of a mixture of penicillins. After extraction by the multiple solvent procedure, the penicillins were converted into crude sodium salts. Benzylpenicillin (penicillin G) was removed from the crystalline material obtained by chromatography and identified. The residue, converted into crystalline ammonium salts, was shown by Craig counter current distribution, and by *Bacillus brevis*-*Staphylococcus aureus* ratio to contain two other penicillins. One, representing the major component, was identified as n-amylpenicillin (dihydropenicillin F) by degradation to n-caproic acid. Oxidative degradation and isolation of propionaldehyde indicated the presence of 2-pentenylpenicillin (penicillin F) as the minor constituent, rather than 3-pentenylpenicillin, as previously assumed.

Surgical Treatment of Gastric, Duodenal, and Gastrojejunal Ulcer, Including the Present Status of Vagotomy. R. COLP. Bull. New York Acad. Med., 24: 755, December, 1948.

The author briefly reviews the development of vagotomy in the treatment of duodenal ulcer. He then reports results in 126 cases of peptic ulcer treated by vagotomy, either alone or combined with other gastric operations. Of twenty-one cases of duodenal ulcer treated by vagotomy alone, nine have remained well, five were improved, and seven required further surgery (five for gastric atony and two for recurrent ulcer). The addition of gastroenterostomy to vagotomy seems to have eliminated the undesirable effects of gastric atony in 26 cases. Only long range follow-up observations will determine whether this combination will diminish the incidence of gastrojejunal ulceration.

The author feels that subtotal gastrectomy still remains the operation of choice in the treatment of duodenal ulcer. He has added vagotomy to gastric resection in a series of patients whose pre-operative acidity was high and who had a tendency to bleed. These patients suffered only a slight increase in post-operative morbidity but no increase in mortality attributable to the added vagotomy. In the treatment of gastrojejunal ulcers by vagotomy, early results were promising, but there have been recurrences. The author advises vagotomy plus further gastric resection for these cases whenever possible. Vagotomy is not recommended for gastric ulcers.

An Angiographic Study of the Form and Function of the Remaining Lung after Pneumonectomy. H. NEUHOF AND R. A. NABATOFF. J. Thoracic Surg., 17: 799, December, 1948.

Twelve patients ranging in age from 18 to 62 years, who had undergone pneumonectomy for malignant tumors were studied by means of angiocardiography in order to determine the form and function of the remaining lung. In the majority of cases, there was no significant abnormality in size, shape or distribution of the vascular pattern in the remaining lung. There often occurred moderate displacement of the mediastinum and great vessels. This was marked in only one case. The expansion of the remaining lung, as judged by the vascular pattern, was not marked. There occurs no alteration in size or recognizable thrombosis within the stump of the resected pulmonary artery.

Pseudocellulitis, a Reaction to Penicillin in Peanut Oil and Beeswax. G. LESNICK, S. SIEGAL, AND L. GINZBURG. Surgery, 24: 289, December, 1948.

Four cases of a severe delayed local reaction to penicillin in oil and beeswax are presented. The reaction is of such intensity as to mimic bacterial infection with cellulitis and erysipelas. Fever and malaise are usual accompaniments. Although alarming in its initial appearance, the reaction resolves completely without specific treatment. The al-

lergic nature of the reaction is indicated by the latent period of seven to ten days, and by associated symptoms of urticaria and joint pains. The results of skin tests with penicillin, peanut oil, and bee protein are discussed. Penicillin is considered the most probable antigenic factor, the menstruum enhancing its antigenic activity. Practical clinical management is presented.

Report on Various Experiences in Group Psychotherapy. W. C. HULSE. The Jewish Social Service Quarterly, XXV: 2, December, 1948.

The paper discusses 8 practical questions of group therapy: 1. Selection of patients. 2. Leadership. 3. Optimal and maximal size of groups. 4. Analytic, didactic or inspirational techniques. 5. Frequency and duration of sessions, duration of treatment. 6. Continuous and fixed groups. 7. Combination of group and individual psychotherapy. 8. Training, supervision, and evaluation of group sessions. The importance of selecting well-diagnosed patients according to their capacity of dealing with each other is stressed. Heterogenous groups are preferable, but differences in age, education and intelligence should not vary too much in a given group. While mentally deficient and severely paranoid persons do not profit in groups permitting spontaneous action, they do well in didactic or in orientation groups. The different techniques and approaches all have their place. No one method is good and applicable for every given group of patients. In integrated groups, functioning on an analytic level, not less than 5 and not more than 8 should be included. Orientation groups might permit larger numbers of participants, but no scientific observation or control is possible in groups exceeding 15 or 20 people. Questions of permissive leadership, of representation of both sexes, and the presence of observers and co-leaders in different settings are discussed.

An Experimental Approach to the Problem of Increasing the Blood Supply to the Lungs. Preliminary Observations on the Use of Plastics. E. S. HURWITT. Surg. Gynec. & Obst., 87: 313, 1948.

A technique is described for the insertion of prostheses circumventing and dilating the pulmonary valve. It is suggested that this approach may be useful in reproducing the effects of valvular insufficiency and in the study of the altered physiology and dynamics of cardiac lesions. A tentative program is proposed, and the properties of polyethylene and lucite are described. The possible application of this method to provide an increased blood supply to the lungs in the face of pulmonary stenosis is discussed.

The Size of the Pulmonary Valve. E. S. HURWITT. Bull. Internat. Assoc. of Med. Museums, 27: 170, 1947.

The protocols of 1000 consecutive autopsies on infants and children, excluding those with cardiac lesions, were reviewed with reference to the size of the pulmonary valve. The average dimensions of the normal pulmonary valve in the younger age groups were tabulated.

Cervicomediastinal and Mediastinal Cystic Hygromas. R. E. GROSS AND E. S. HURWITT. Surg., Gynec. & Obst., 87: 599, 1948.

The clinical and laboratory findings of cervicomediastinal and mediastinal hygromas are reviewed; the successful management of 2 additional cases of cervicomediastinal lesions and 1 mediastinal cyst is reported. The cervical portions of hygromas are best treated by a meticulous dissection and removal of the cystic structures. Whenever possible, treatment of the thoracic lesions is preferably done by complete extirpation of the presenting mass. Under some circumstances, a cervicothoracic hygroma can be treated by surgical excision of the cervical portion and transcervical approach to the intrathoracic portion, the latter being treated by intense chemical sclerosis followed by external drainage. If such therapy is followed by persistence or recurrence of the intrathoracic component, thoracotomy for excision of the remaining hygroma is indicated.

Preliminary Observations on the Use of Human Arterial Grafts in the Treatment of Certain Cardiovascular Defects. R. E. GROSS, E. S. HURWITT, A. H. BILL, JR., AND E. C. PEIRCE, 2ND. New England J. Med., 239: 578, 1948.

Following the demonstration in the experimental laboratory of the successful transplantation of segments of the aorta, both fresh and preserved, from one dog to another, application of the technique was performed in humans. The report includes the successful transplantation of arterial grafts in 9 cases of tetralogy of Fallot and 3 cases of coarctation of the aorta.

Acute Appendicitis Occurring During the Course of Other Diseases. E. S. HURWITT. New England J. Med., 236: 20, 1947.

Ten representative cases of acute appendicitis occurring during the course of other diseases are presented. The tendency to interpret such cases as manifestations of the underlying disease rather than as an independent lesion is pointed out. The consequences of a temporizing attitude in terms of the increased morbidity of appendiceal peritonitis is discussed.

Evaluation of the Precordial Leads of the Electrocardiogram in Obesity. H. L. JAFFE, E. CORDAY AND A. M. MASTER. Am. Heart J. 36: 911, December 1948.

CR, CL, CF and unipolar (V) chest leads were recorded in 34 obese persons with normal hearts and blood pressures. T-wave inversions hitherto considered abnormal were found in CF and CL leads in approximately 15 per cent of the cases. No T-wave inversion was found in the V leads except in position 1 which is not significant. The false T-wave inversions in CF and CL leads are shown to be the result of the influence of the left leg and left arm potential in the respective connections. The position of the heart determines the potential in each extremity. The routine use of unipolar (V) precordial leads is recommended since false T-wave inversions are known to occur also in asthenic persons.

Neuroma of the Mandible. M. J. ORINGER. Oral Surg., Oral Med., & Oral Path., 1: 1135, December 1948.

Persistent paresthesia and a painful trigger zone following surgical removal of a mandibular molar is reported. A mandibular depression covered by thickened mucosa, and roentgenographic radiolucence extending into mandibular canal were noted. Local pain persisted despite regional block and direct infiltration anesthesia. A mucoperiosteal flap was incised and retracted. Tenacious fibrous tissue occluded the orifice of a mandibular perforation, with partial attachment to inferior dental nerve. The attached fibers were severed, the fibrous mass resected, the perforation margin freshened, the orifice filled with sterile gelatin and the flap restored and sutured. Healing was without incidence. The pain ceased and paresthesia subsided. Pathologic Examination: Mass consisted of nerve and fibrous connective tissue. Diagnosis: Neuroma. The case history, clinical evidence, and laboratory findings bear close resemblance to amputation neuroma. Traumatic perforations into mandibular canals permit extrusion of nerve fibers and invasion of granulation tissue, which may produce tumor growths.

Anomalies of Human Dentition. M. J. ORINGER. Oral Surg., Oral Med. & Oral Path., 1: 1119, December, 1948.

All anomalies are of academic interest because they are deviations from the normal. Some dental anomalies are fairly commonplace, but cases of abnormal complete dentition or individual tooth formations are sometimes encountered, that open speculations as to their cause. A report of 10 unusual cases is presented, and the possible cause factors thoroughly explored. Scientific investigation has established the reasons for the various dental developmental stages, and for pathologic changes that accompany dental disease. Although prenatal influence, heredity, metabolism, and disease are undoubtedly factors, specific prenasal and etiologic factors involved in the phenomena of dental anomalies are as yet comparatively unknown. The author believes that stimulation of similar chains of thought may ultimately provide specific clues to these etiologic factors.

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THE ISADORE FRIESNER LECTURE*

EMOTIONAL FACTORS IN THE ETIOLOGY OF
INTERNAL DISEASES†

J. GROEN, M.D.

[Amsterdam, Holland]

In the course of a conversation with Dr. Allan Gregg, Director of Medical Sciences of the Rockefeller Foundation, I was asked what in my opinion was the reason for the fact that psychiatry had profited so little from the tremendous advances that had been made in other branches of medicine during the last fifty years. My reply was that progress in modern medicine was largely due to the introduction of exact methods of thinking, the application of physics and chemistry to the study of disease, and the introduction of an experimental and quantitative approach to clinical problems. The human mind, however, the domain *par excellence* of psychiatry, has not been similarly explored, and it is chiefly through the lack of suitable methods of research that psychiatry has lagged behind. The situation has been aggravated by the fact that most investigators shrink from a field where analogies rather than measurements seem to be the sole available tools of research.

Dr. Gregg praised me for the explanation. "But", he said, "suppose I would ask you, as a modern physician, to improve the situation and indicate how exact methods may be used in this field, what would be your answer?" To this question I had no reply; I had never given it a thought.

I recall this incident without too much shame, for my own ignorance was shared by most clinicians of that day. It is true that Pavlov and Cannon had long since done their pioneer work in physiology. In psychiatry Freud and Adolph Meyer had paved the way for an approach, based on etiology. It is also true that every clinician who could take a good history, and who was not in the habit of regarding emotions (except his own!) as "mere nonsense", had ample opportunity to observe that patients with peptic ulcer, hypertension, asthma, and angina pectoris improved during more favorable life situations, and got worse or died under adverse circumstances. In fact, such observations were so common, that a wise practitioner once told me, that he would never have dared to write a paper dealing with the impact of emotions on bodily disease, because it would mean writing about things known to everybody. In Europe, Schwarz (1), Mohr (2), Alkan (3), Wittkower (4), and McGregor (5) had already compiled and extended these clinical observations. In the United States, Dunbar (6) had published a comprehensive review, and Draper (7, 8), Murray (9), and

* Delivered at The Mount Sinai Hospital, April 26, 1950.

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Alexander (10) had carried out their pioneer studies. Most of these attempts, however, had evoked more criticism than enthusiasm, and the role of life situations as factors in the origin and evolution of bodily illness remained a field for speculation rather than investigation. The founding of the American Society for Research in Psychosomatic Medicine, and the appearance of the Journal of Psychosomatic Medicine (11) did much to stimulate interest among those psychologically oriented, but their influence among clinicians generally was less striking. Clinical investigators apparently saw no way to apply their physico-chemical approach to problems connected with diseases of emotional origin, and they could not be induced to do so, even by the most impressive concepts about hidden mechanisms, underlying human behavior, or by the most ingenious symbolic interpretations of disease phenomena.

I will not attempt to outline what has brought about the general change in attitude among the profession towards what is now designated as the "psychosomatic approach". In my own case, this was due to a paper written by a young American chemist who, as a medical student at Columbia University, was the first to draw attention to the possibility that emotional factors might play a role in the production of ulcerative colitis (9). In 1938, one of the psychiatrists in Amsterdam drew the attention of my former chief, Dr. I. Snapper, to Murray's paper. Snapper did not think much of it, and neither did I. I had always considered psychiatry as "a queer job for queer fellows" (and by *these* I meant not the patients, but the psychiatrists). I thought that I could disprove the absurd supposition that emotional influences could directly provoke organic disease. I referred 2 of our cases of severe ulcerative colitis to the psychiatrist, and to my surprise he reported that he had found similar character traits and emotional conflict situations as Murray had described. As a cautious internist, I hesitated to accept his findings, but when I interviewed these patients, I was deeply impressed.

This experience would probably not have significantly influenced my work, if the war had not broken out the following year, and the German invasion of the Netherlands had not created a profound change in my medical activities. I was forced to leave the Wilhelmina hospital and resign from the University. Here I was, a man, trained to do research in the wards and the laboratory, without a ward or a laboratory. For a time I had to interrupt my former work on nutrition and metabolism, and I had to find another field of interest, where I could work and do research within the scope of the limited practice which I was allowed to pursue. I determined to study the role played by emotional factors in the etiology of internal diseases.

In retrospect, I feel that I may have been poorly equipped through lack of a specialized training in psychiatry. On the other hand, I had 3 assets of which I was only partly aware at the time: first, I had learned to take a thorough medical history which is still, I feel, one of the most important tools in diagnosis; second, I had always been interested in patients as fellow human beings in distress, and third, because of the situation I was then in, I had ample time.

The way I went about my study was simple. After taking a medical history and performing a physical examination, routine laboratory investigations and

X-ray studies, I asked the patient if he would be willing to give me an opportunity to correlate his life history with the development of his illness. I explained to him that this was a hobby of mine, and that I would appreciate his cooperation, provided he was interested and had the time. In this way I collected a series of biographies from patients with the most varied internal diseases. I realized from the outset that this method of approach would be most valuable if I included in the study not only those patients in whom I suspected that an emotional factor had been operative, but all my patients, irrespective of the disease from which they were suffering. The data obtained were worked up in the following way: After a sufficient number of biographies of patients with a variety of internal diseases had been obtained, they were classified in groups, according to the clinical diagnosis. With the material thus arranged I tried to find the answer to 2 main questions:

1) Is there to be found in patients with a certain illness a common personality type, which is more or less specific for their disease, in the sense that it is different from the personality of normal individuals, and of patients with other diseases? Could it be that their personality structure had predisposed these patients to the development of their disease, under the stress of an unfavorable life situation?

2) Was there to be found in the life history of these patients a time relationship between the emotional conflicts which they had experienced and the inception of their disease, and evidence that an emotional conflict situation had come first, and the outbreak or recurrence of the disease second? If this proved to be true, then the possibility of an etiologic role of the emotional conflict, acting on a predisposed personality, could be envisaged. Alternatively, was it possible to trace any so-called "spontaneous" curves in the course of the disease to an improvement in the patient's life situation?

This investigation was the main work with which I occupied myself during the period of the German occupation. After the liberation of the Netherlands when I resumed my position in the medical services of the Wilhelmina hospital, the Rockefeller Foundation provided the opportunity to carry on the work on a large scale, in collaboration with a trained psychiatrist, a psychologist, and a physiologist.¹ The type of patients examined remained the same, so was the object (12), a study of the possible etiological significance of the personality structure and the emotional conflicts in patients with internal diseases.

PRESENT ORGANIZATION OF THE PSYCHOSOMATIC RESEARCH GROUP IN AMSTERDAM

The Amsterdam group consists of a physician (J. G.), who is head of the department of medicine, a psychiatrist (J. B.), a psychologist (S. J. V.), and a physiologist (J. M. v. d. V.), each of whom examines the patients admitted to

¹ The author is grateful for this opportunity to express his appreciation to his associates, Drs. J. Bastiaans, S. J. Vles, and J. M. van der Valk, and to Dr. L. van der Horst, Professor of Neuro-Psychiatry at the University of Amsterdam, for their valuable cooperation. Almost all of the results and opinions, given in this paper, have been achieved through common efforts (12).

the department. The psychiatrist was delegated by his chief, Dr. L. van der Horst, Professor of Neuro-Psychiatry, for the psychiatric study of patients with internal disease.

The physician and his assistants see the patient first. A history is taken, after which the usual physical examination and laboratory tests are carried out. The psychiatrist, who is also psychoanalytically trained, subjects the patient to repeated interviews, which take a total from three to ten hours, thus obtaining a fairly complete biographical anamnesis. The latter enables the investigator to trace the relationships, if any, between the strivings and attitudes with which the patient faced the various situations during his life, and the development and course of his disease. The biography also provides him with information as to the hereditary background, conditions in the parental home, personality development during early childhood, school life, satisfaction in occupation and marriage, etc. Although the aim is directed at securing a chronologically arranged account of the patient's life, the investigator's attitude is largely non-directive, and a certain latitude for free association is allowed during the interviews. Attention is directed not only to the content, but also to the form of the answers and to the patient's behavior during the interviews. Sometimes the order in which the events are dealt with is varied, but in the subsequent compilation of the biographical report, the data are arranged systematically and chronologically. Special attention is paid to a careful unraveling of the emotional situation which preceded the onset of the illness. In doing so, we not only induce the patient to reconstruct the environmental situation, but we try to find out specifically the manner in which he himself has reacted to it. It should be made clear that this approach does not in any way constitute psychoanalysis. On the other hand, a psychiatrist with training in analytical psychodynamics is often able to reconstruct from the biography the mechanisms, that have been operative in the shaping of the adult personality structure, and the strivings and adaptive mechanisms that have been the active forces behind the various life events.

The psychologist uses for his investigation chiefly the Behn-Rorschach-ink-blot test (13, 14) in an effort to obtain objective data about the subject's personality structure. These data are worked up statistically and are compared with those obtained by the same test in a large number of "healthy" individuals, picked at random from the same social strata. By this independent approach we try to find an objective expression of the possible deviations in personality structure, and of the differences in personality that might exist between patients with different diseases, and, if present, to evaluate their statistical significance.

The object of the *physiological studies* is to ascertain whether and to what extent the patients show changes in pulse and respiration, blood pressure, skin temperature, plethysmogram, electrical resistance of the skin, etc., during a period of induced emotional tension. For this purpose the patient is studied alternately during a state of emotional relaxation, and then of tension, created sometimes by induced silence and immobility, which requires self control, or by an interview. This physiological study of psychosomatic disturbances, first introduced by Wolf and Wolf and their associates (15, 16, 17), forms an in-

valuable supplement to the more descriptive approach by the psychiatric interpretation of the biographical anamnesis.

PSYCHOSOMATIC RELATIONSHIPS IN CLINICAL MEDICINE

Since our team is attached to a department of medicine to which mainly patients with so-called "organic" illnesses are admitted, we have, for the time being, restricted our activities to these diseases. We accepted this limitation with the conviction that it is better to make an intensive study of a small segment of a new field than to risk losing one's way among a multiplicity of problems. It should be stressed, however, that the territory which lies open for a scientific study of psychosomatic relationships is, of course, much larger. Psychosomatology (a word which we prefer to "psychosomatic medicine") is by no means confined to the study of "functional" diseases, as many physicians still believe. It concerns itself with the study of psychosomatic relationships in health and disease, and it is simply because most physicians have more to do with sick than with healthy people, that most investigations have concerned themselves primarily with the abnormalities of the psychosomatic relations. Our group, accordingly, restricts itself to internal diseases.

In Table I we have attempted to give a schematic classification of the various forms in which a disturbance in the psychosomatic relationships can manifest itself. The Table is the result of a provisional exploration of the field, and is intended to bring about a clarification of thinking. Reality never lends itself to compression into diagrams, and this is particularly true in cases of psychosomatic phenomena. It should be kept in mind that the psychoneuroses, organ neuroses, and conversion states cannot be so sharply distinguished from one another, as they appear here. The Table has, however, proved its usefulness, even if it has done nothing else but illustrate how vast and varied the area is with which modern "psychosomatics" is concerned.

The investigations of the last few years have revealed that emotional factors are especially evident in certain internal diseases, the causes of which have thus far been more or less obscure. In ulcerative colitis (18), peptic ulcer (19), and bronchial asthma (20), this proved to be so apparent, that our group is now inclined to regard the psychogenic component as one of the most important factors in these conditions. Should further investigations support this view, we shall have arrived at a new etiological concept of disease. Up to the present it was assumed that emotional factors could give rise only to purely "functional" psychoneuroses or organ neuroses. It now appears that psychogenic causes of disease can also give rise to *morphological* changes in various organs. To distinguish the diseases in which a predominantly psychogenic etiology has induced morphological changes, we suggest the term *psychosomatoses*. In Table I we have separated them from another group of diseases in which we have as yet insufficient evidence of a causal psychogenesis, but in which it was found that emotional factors had a marked *modifying* influence on the outbreak and course of the disease. To this group belong essential hypertension, thromboangiitis obliterans, Raynaud's disease, rheumatoid arthritis, multiple sclerosis, diabetes

mellitus, and hyperthyroidism. We believe it to be by no means impossible, that in the future some of these diseases may be classified as psychosomatoses, but, as yet, there is insufficient evidence for such a classification. In another group we have put a number of diseases, in which the exogenous causal agent is known, but where we also found, in a high percentage of cases, definite in-

TABLE I
Schematic Classification of Psychosomatic Disturbances

1. *Somatic Manifestations of Psychoses:*
 - (a) *Motor:* agitation, catatonia, etc.
 - (b) *Sensory:* hallucinations.
 - (c) *Vegetative:* changes in circulation, respiration, digestion, metabolism, etc.
 - (d) *Indirect bodily consequences:* effects of poisons and trauma after suicidal attempts, exhaustion, deficiency diseases, etc. in psychotic patients.
2. *General "Nervous" Disorders in Psychoneuroses:*
Fatigue, insomnia, irritability, impairment of concentration, decreased libido, etc.
3. *Conversion Phenomena, Usually with an Obvious Symbolic Significance:*
 - (a) *Motor (in voluntary muscles):* paralysis, hyperkinesia, aphonia, hyperphonia.
 - (b) *Sensory:* blindness, deafness, anesthesia.
4. *Organ Neuroses* (functional disturbances localized in one or more organs of the vegetative sphere, without morphologic substrate and with a predominant psychogenic etiology):
 - (a) *Motor (in involuntary muscles):* cardiospasm, functional vomiting, habitual constipation, nervous arrhythmias, diarrhea, impotence, etc.
 - (b) *Sensory:* nervous angina pectoris, abdominal pain, headache, dizziness, etc.
 - (c) *Vegetative (secretory and vascular):* hyperhidrosis, Raynaud's disease, erythralgia, migraine.
5. *Psychosomatoses* (functional disturbances with morphologic changes, localized in one or more organs of the vegetative sphere, developing under the influence of unexpressed emotional stresses, usually in predisposed individuals): ulcerative colitis, peptic ulcer, asthma.
6. *Psychogenic Influences on Bodily Diseases:*
 - (a) Metabolic (diabetes)
 - (b) Vascular (thromboangiitis obliterans, coronary thrombosis, hypertension).
 - (c) Joint (rheumatoid arthritis).
 - (d) Endocrine (hyperthyroidism).
 - (e) Allergic (hay fever, urticaria).
7. *Psychogenic Changes in Resistance against Infections, Influencing the Outbreak and Course of the Disease:*
Herpes simplex, erysipelas, tonsillitis, tuberculosis, etc.
8. *Combinations and Transitions.*

fluence of psychological factors on the origin and course of the disease. Among these are infections like pulmonary tuberculosis, and recurrent erysipelas.

SOMATOPSYCHIC RELATIONSHIPS

In addition to the aforementioned psychosomatic disturbances, our investigations have brought to light many instances of *somatopsychic* disorders. In Table II a separate place has been reserved for the changes in behavior which may be observed in patients with endocrine disturbances. They are the results

of a disturbance in the hormonal regulation of normal behavior patterns, and are clearly observed in the disturbed sexual behavior of man and animals under influence of experimental or clinical derangement of the activity of the sex hormones. But we are also familiar with the profound changes in other aspects of intellectual and emotional life, when one of the glands of internal secretion functions either excessively or inadequately.

Of late, increasing attention is being paid to the mental changes which occur in persons who have developed a lesion, due to trauma, encephalitis or operation, in certain specific areas of the brain. Particular interest has been aroused by the fact that the intellectual, affective or moral defects in such individuals may be very similar to those encountered in neurotic, psychopathic or psychotic individuals without known anatomical damage. It has even been found possible to correlate some of these intellectual, moral or emotional disturbances with

TABLE II

Schematic Classification of Somatopsychic Disturbances

1. *Secondary Neuroses and Psychoses:*
In patients with heart disease, anemia, exhaustion, dehydration, intoxication and fever.
2. *General "Nervous" Disorders in "Organic" Diseases:*
Fatigue, insomnia, irritability, impairment of concentration, decreased libido, etc.
3. *Neurotic and Psychotic Behavior Changes in Endocrine Disorders:*
Hyperthyroidism, myxedema, adrenal-cortical tumors, eunuchism, menopause, hypoglycemia, etc.
4. *Psychic Changes Occurring in Patients with Organic Brain Lesions:*
Trauma, lobotomy, arteriosclerosis, encephalitis, general paralysis, cerebral tumors.
5. *Psycho-reactive Neuroses and Psychoses:*
Psychic changes as reaction to pain, restriction of freedom, nursing, social and other factors connected with illness, hospitalization and disability. (These are often activations of reaction patterns already present in the patient's personality structure, which had so far been compensated but now lead to difficulties in adjustment). A regression into more infantile behavior patterns is a regular phenomenon in almost all patients. It may be especially pronounced in patients with painful, wasting, long-standing, or incurable disease, or invalids.
6. *Combinations with Psychosomatic Syndromes.*

certain, more or less circumscribed, defects in areas of the brain. The frontal lobes, and the diencephalon have been found to be particularly important in this respect.

It should be noted that item 2 of Tables I and II describes general "nervous" complaints (fatigue, insomnia, impairment of concentration, diminished libido, etc.) both as psychosomatic and as somatopsychic disorders. This is done for practical reasons (to stress the necessity for an accurate diagnostic search for the cause of these general complaints in each individual case), and also to emphasize the fundamental fact that the same symptoms and probably the same underlying conditions can be caused by "functional" organic injury to the brain.

We are concerned almost daily in our wards, dispensaries, and offices with the psychological effects produced upon our patients by the changes which the

illness causes in their life situation. This is very evident in patients who are afflicted with tuberculosis and are thus confined for long periods of time in a hospital or sanatorium (21). Similar reactive processes take place in patients who leave the hospital, incompletely cured, such as orthopedic invalids, the disabled or war-wounded, those deformed by poliomyelitis, and in the case of the blind or deaf. In the treatment of patients with incurable disease the physician is constantly confronted with the problem of the patient's reaction to his illness, and to the unfavorable prospects for his future. Psycho-reactive processes of this kind may markedly influence the course of the ailment, even in the so-called "organic" diseases. They often determine whether the patient will or will not cooperate in achieving recovery. They are of great importance from the social and humanitarian points of view, because it depends on them, often more than on the actual disease, whether an invalided patient will be able to resume work or learn a new trade or profession; whether he feels himself down and out, or whether he is able, despite his disability, to make a satisfactory adjustment in life.

To a certain extent every patient experiences some mental effect of his bodily illness. Psychoanalysis has taught us that, what takes place, is fundamentally a *regression* into a more infantile form of emotional life. It has long been known that patients, especially those who have to remain in a hospital for a long time, become egocentric and oversensitive, that they show diminished self control and hence a greater lability of mood. Patients, as a whole, cry more easily and are more quickly consoled, they have an excessive desire to be loved, and feel a greater need for care and protection, than healthy individuals. Generally speaking, patients are more amenable to suggestion; their faith in doctors and nurses resembles a child's faith in its parents. A narrow range of interest, petty jealousies, quarrels over trifles, alternating with reconciliations, a return to childish jokes, pastimes and occupation, are characteristic of the emotional atmosphere of many hospital wards. All these phenomena are explained by the concept of psychological regression taking place under the influence of changes which the disease has produced in the individual's life situation.

Not all patients show this regression to the same degree. In our experience, it is most pronounced in diseases which bring about much pain and other physical discomfort, in diseases of long duration and, above all, if the prospects of recovery are poor. The regimentation of the hospital with its restriction of freedom plays its part. It is, however, easily understandable that patients whose ante-morbid personality was poorly integrated, and who are therefore less able to adapt themselves to difficult life situations, will be particularly incapable of coping with a serious illness. In other words, in individuals, who were already emotionally immature before they became ill, the regression, initiated by the illness, brings to light preexisting infantile neurotic traits. The disease and its social consequences may thus create new conflicts which, in turn, may aggravate an existing psychosomatic disorder. This is what we have meant by the item: Combinations in Tables I and II. Some of our patients with ulcerative colitis or asthma, created a serious problem for the nursing staff, because of

their selfish behavior, hypersensitivity, and inability to adjust. The doctor or nurse who fails to realize that a regression of the personality is at work in these cases, might feel and display antipathy to these patients. The patient realizes this, interprets it as a rejection by the admired doctor or nurse, and as a result suffers further regression and even an aggravation of his disease. It is, therefore, important that the doctor and nurse maintain a friendly attitude in dealing with such patients.

PSYCHOSOMATIC SPECIFICITY

It was a surprising experience for the members of our group to find how often patients with internal disease show neurotic personality traits; it was, indeed, amazing how frequently we encountered emotional difficulties in the biographies of seemingly emotionally "normal" patients. This frequent occurrence of neurotic traits in a random group of non-psychiatric patients is perhaps only a sign of the widespread occurrence of neuroses among our general population. Thus, one of the difficulties in our investigation turned out to be, not the rarity of psychological disorders in our medical patients, but rather an *embarras de richesse*. This meant that the psychiatrist had to screen his biographical material very thoroughly and critically in order to ascertain in what cases we were dealing merely with a concurrence of emotional maladjustments and somatic disease, and in which cases there might exist a causal relationship between them.

A comparison of the psychiatric and psychological data, collected from the various groups of patients, with each other, and with similar data from "normal" (healthy) persons revealed, that the patients suffering from some diseases showed a number of traits in their personality structure which distinguished them from other groups on one hand, and from healthy subjects, on the other. It was not so much a difference in individual traits, but rather a *combination* of certain character traits that distinguished the patients with one disease from another.

There were other differences. On closer examination of the emotional difficulties first to be experienced by the patients shortly before the illness developed or aggravated, a certain degree of similarity was found between the conflicts of patients who were suffering from the same disease. These emotional life situations, found in patients with the same disease, differed, however, from those which were encountered in patients with other diseases. This became obvious when we concentrated our attention not so much on the objective events which had served as psychic traumata, but on the subjective response which this experience had produced in the patient's emotional life. Thus, internal conflict situations of a definite type, which had preceded the appearance of the disease, were clearly identified in cases of ulcerative colitis, peptic ulcer, and bronchial asthma. In pulmonary tuberculosis and rheumatoid arthritis the findings, though less definite, pointed in the same direction, while in essential hypertension chronic conflict situations also of a distinctive type were encountered. These findings were different from those in "control" patients, who suffered from Hodgkin's disease, various forms of carcinoma, or leukemia. In the latter diseases we have also found peculiarities in the personality structure and sometimes

emotional conflicts, which had taken place at the time of the recognition or first manifestation of the disease. In these patients, however, the chronological relationship between conflicts and the outbreak of illness was irregular, a similarity in the personality type between patients with the same type of tumor was not found, and the conflicts were of different kinds in different patients; at times they were entirely absent.

These findings have led us to agree with the opinion, expressed some years ago by Alexander and his associates (10, 22, 23) that the connection between a state of emotional tension and the ensuing bodily disturbance is not accidental. It is not so, that people, in general, are liable through "nerves" or "overwork" to acquire a psychoneurosis or peptic ulcer, or to be unable, through a decrease of resistance, to overcome a tuberculous infection. It is not accidental that one patient develops a peptic ulcer, another colitis, and a third asthma, all *via* a psychogenic mechanism. The relationship seems more specific and can be summed up as follows: Some individuals, with a certain character structure, seem to be predisposed by the nature of their personality structure to react to a difficult life situation, which threatens their security, not by adequate action, but by emotional conflict. The latter varies with the type of personality and the nature of the stress situation. If the conflict is not discharged by action or speech, it persists and can create a state of acute or chronic emotional tension, which seeks another outlet. In this way it may affect one or another of the organs in the vegetative sphere, in accord with the nature and degree of the tension induced.

The connection between psychic stress and disease seems, therefore, to be as *specific* as, for instance, that between a bacterium and the disease it causes. Typhoid fever and tuberculosis are both infectious diseases caused by bacteria, but the tubercle bacillus causes the typical lesions of tuberculosis, while the typhoid bacillus, the specific picture of typhoid fever.

Recently the existence of psychosomatic specificity has been challenged by several investigators, especially by psychoanalysts. They have pointed out that, fundamentally, all patients with these psychosomatoses or stress diseases are emotionally immature, and their conflicts stem from their inability to find an adult constructive solution for the clashes of their inner strivings with the requirements of their environment. They are, according to this view, not different among themselves and not different from ordinary psychoneurotic patients. Perhaps Table III may help to elucidate what is at the bottom of this controversy. It contains a schematic presentation of the character traits and conflict situations as they emerge from our study of patients with ulcerative colitis, peptic ulcers, and asthma. It will be seen that in the deeper strata of the personality structure similar traits were encountered in patients suffering from the three different diseases with dependency, oversensitivity, and insecurity as common denominators. Moreover, these traits were not only found in patients with any of these diseases, but they were also universally present in all of our psychoneurotic patients. The differences, however, in personality structures between these three groups of patients on one hand, and between

them and psychoneurotics on the other, became evident not so much in these deeper strata as in the surface attitudes. The patients with colitis, ulcer, and asthma distinguished themselves from each other chiefly in the mechanisms which they used to overcome their underlying emotional immaturity, and to cope more or less successfully with the requirements of their paternal, marital, occupational, and social environments. There were differences in the mechanisms which modified the original aggressive tendencies of the individual, so that he

TABLE III
Schematic Differentiation of Personality Types

DISEASE	ULCERATIVE COLITIS	PEPTIC ULCER	ASTHMA
Deeper traits	Dependent Egocentric Oversensitive Insecure.	Dependent Egocentric Oversensitive Insecure.	Dependent Egocentric Oversensitive Insecure.
Outward appearance	Mild, neat, fussy, insecure, sentimental, ambition, honesty, activity, diligence, } moderate responsibility, success	Driving, self-assertive, tense, competitive, ambitious, honest, responsible, active, hard-working, often socially successful.	Impatient, stubborn, tyrannical, moody, outbursts of ambition and activity, alternating with shy or negativistic attitudes. Sometimes successful, often social failures.
Attitude toward marriage partner	Overtly dependent, often frigid or less potent. Marriage often late or not at all.	Overtly protective and dominating. Sex life usually normal, loyal to partner.	Tyrannical and exacting. Often frigid, sometimes promiscuous or impotent.
Gratification of aggressive tendencies	By transference to a parental figure.	Competitive.	Sadistic.
General behavior pattern	Imitating standards of individual environment.	Living up to ideals.	Egocentric, often poorly adapted.

could still obtain satisfactory gratification for his deeper strivings in his present position in society. It is in these so-called defense mechanisms, perhaps better called adaption or compensation mechanisms, that the personalities of our patients appeared to acquire their specific character. This explains why a psychoanalyst, whose main concern is to "dig deep" into the patient's personality, may overlook differences that are apparent to an observer who studies the total personality.

Table IV reflects our attempts to define the emotional conflict situations that seemed to be more directly responsible for the outbreak of each of the three diseases. Most of these patients had been able to cope more or less successfully with their individual life situations, so long as they had not brought about too severe a stress. Their underlying emotional immaturity, however, had made them less able to withstand the stresses of certain unfavorable circumstances, which affected them more than normal individuals, because of certain weak spots in their personality structure which impaired their reserve of adaption. In this sense the disturbing life situations were induced, partly, by unfavorable circumstances, partly as the result of an inherent weakness which transformed a situation, which for others would have been little more than an annoyance, into a traumatizing experience. Even this trauma would not have upset their psychosomatic balance if the patients had been able to give vent to their feelings in adequate action or words. This, however, they would or

TABLE IV
Schematic Differentiation of Conflict Situations Preceding Outbreak of Disease

DISEASE	ULCERATIVE COLITIS	PEPTIC ULCER	ASTHMA
Precipitating conflict situation	Harsh treatment, love loss, humiliation as man or woman. Counter action inhibited by fear.	Frustration in occupation or social activities, in spite of vigorous counter action, combined with insufficient gratification for dependent strivings.	Frustration in attempts to dominate a beloved person, or (and) protest against having to submit to authority. Counteraction inhibited for fear of rejection.
Reason for emotional control (restraint)	Anxious, fearful of other people's opinion.	Compulsive, rigid standards.	Distrustful, fear of being misunderstood or rejected.

could not do. Almost all our patients with psychosomatoses had tried to conform to the standards imposed on them by the environment, and thus, their conflicts were not ventilated. Neither did they tell other people, least of all their parents, wives or husbands about their frustations, anxieties or hostilities. Sometimes they were only partly conscious of the emotion which the stress situation had produced in them. Sometimes they inhibited any tendency to act upon or communicate their feelings, either for fear of the consequences, or because of a too rigid standard of self restraint. In other cases there was nobody available whom the individual could use for his emotional outlet. The result was that in our colitis, asthma, and ulcer cases we did not have to deal only with emotional states, but with emotions that had been in some way or other restrained, controlled or inhibited. Tension is the word which describes the condition of restrained emotion. Diseases like ulcerative colitis, peptic ulcer, and asthma occur in our experience not in the so-called emotionally unstable

individuals who discharge their feelings freely, but rather in those who try to master, to control them, in other words, in individuals who appear not so much emotional as tense.

Space does not permit to go further into the importance of the degree of this mechanism as another factor in the determination of the specific somatic response to emotional tension (table V). However, I would like to point out that, at least in our experience, the actual conflicts, which preceded the onset of the disease, in the so-called psychosomatoses (peptic ulcer, ulcerative colitis, etc.) were generally less deeply suppressed than the deep rooted conflicts which seem to underlie many of the psychoneuroses or psychoses. These patients with internal diseases had striven much more *consciously* than the psychoneurotics or psychotics which the psychiatrist sees, to preserve their balance, at least outwardly. They wanted, above all, to appear normal to themselves and to those about them. More than "psychiatric" patients they tried to conform to the behavior, standards, and ideals of the social group with which they were identified. Thus, it is more with controlled (restrained) or suppressed, than with deeply repressed (actual) conflicts, that we are dealing in our patients

TABLE V

Schematic Classification of the Degrees in Which Emotional Conflicts May Be Banished from Consciousness

1. *Repression*: Conflicts are buried deep in the unconscious and cannot be brought back to consciousness by simple events or interviews.
2. *Suppression*: Conflicts are present in a half-conscious state and can be brought back into consciousness by events or interviews.
3. *Restraint*: Conflicts are—at most with short interruptions—consciously present, but are inhibited from expressions or discharge: tension.

with psychosomatoses. It was the same attitude of preferring to appear ill rather than abnormal, which made almost all our patients with ulcerative colitis, asthma etc. shy away from the idea of consulting a psychiatrist, and which induced so many of them to "bottle up" their emotions. In doing so they followed a behavior pattern of self-control which has, during the last century, become one of the most characteristic features of interpersonal relationships in western culture. Before this time self-restraint was practiced only among the aristocracy; it is only during the past hundred or more years that it has spread among the lower strata of the western populations, where it has become a part of the mores. Could it be possible that this widespread tendency to inhibit our emotions and to behave normally, even when we are inwardly in turmoil, has contributed to the increase in frequency of such diseases as peptic ulcer, ulcerative colitis, hyperthyroidism, etc., which were practically unknown (at least had not been described) until about a century ago?

PSYCHOSOMATIC OBSERVATIONS DURING WORLD WAR II

An unexpected body of evidence, supporting the validity of the concept of a psychosomatic specificity, was almost thrown into our laps by the experience

of the German occupation of the Netherlands during the years 1940-1945 (24). During that period Holland was subjected to the impact of a hostile totalitarian regime, a police state in *optima forma*. An increasing number of industrial workers were drafted and forcefully transported to Germany to work in the war industries. A complicated system of regulations restricted the freedom of the individual. Severe punishment followed every expression of dissent in speech, writing or action. Treason lurked in every corner. Newspapers were either banned or "nazified". Everybody had to surrender his radio set to prevent the population from listening to allied broadcasts. If anything happened that resembled sabotage, and the culprits could not be found (which was often the case), the Gestapo would arrest prominent citizens, or those who happened to live near where the incident had happened, and send them to prison camps, or sometimes execute them as hostages. Execution of those who dared to resist became a common occurrence. Those who were sent to concentration camps, were exposed to hard work, hunger, cold, and even torture and death from starvation. In addition, large parts of our stores of food, clothing, gasoline, and coal were expropriated and transported to Germany. As imports had stopped, a shortage of almost everything ensued, and practically every food item had to be rationed. However, during the first years of the occupation the rations, although austere, were still above starvation level, especially if supplemented, as everybody did, with some additions "on the outside".

Special measures were taken against the Jews among whom the author was compelled largely to limit his practice. Jews were dismissed from Government and University positions. They were not allowed to remain members of clubs, of philanthropic, scientific or other societies. They were not allowed to use street cars or trains, to drive cars, to enter restaurants, museums, libraries, movies or theatres. They were allowed to do their shopping only at certain shops, and during certain hours of the day, and had to be indoors after 8 P.M. They were forced to wear a yellow star with the word "Jew" on the left side of the chest. They were deprived of their land and houses and had to deposit all their money, stocks, paintings, jewelry, etc. in a German bank. In the summer of 1942 the Germans began to round up the Jewish population. In little over a year they deported more than 100,000 of the 140,000 Jewish citizens of the Netherlands to concentration camps in Poland. This was done by rounding up whole city blocks where the Jews had been forced to concentrate beforehand. Together with those who tried to hide, but were discovered, these men, women, and children were first sent to a transit camp in Holland, where conditions were not too bad, but were soon deported to Poland where, as we learned when the war ended, they almost all died in gas chambers.

In September 1944, about 6 months before the liberation of the country, the situation in Holland became suddenly worse. In order to assist General Montgomery, who was then launching his airborne attack on Arnhem, the Dutch Government in exile in London called a railway strike. The Germans retaliated by forbidding all traffic by road or canal. As a result the cities were isolated from the rest of the country, and there was no way to transport food or fuel. As there had been no reserves famine, darkness, and cold soon followed.

The caloric allotment dropped to about 600 a day of which 10 to 15 gm. were protein, and the rest almost entirely carbohydrate. Everybody who was in a condition to do so, began to try to get food, either by walking or riding on a bicycle to the country, where one tried to exchange with the farmer whatever valuables one had for wheat, rye or potatoes (money had practically lost its value). Day after day long columns of people walked for miles, transporting bags in perambulators or wheel-barrows. Soon the farmers living near the towns had nothing left, and the "hunger treks" stretched for distances of 30 miles or more. Even the food, obtained in this way, was almost entirely of vegetable origin, and very coarse in consistency. Our meager diet in those months consisted of coarse, whole meal bread, primitively prepared from wheat or rye grits which we ground in a coffee mill. Nothing edible was discarded. Potatoes were eaten with the peel; vegetables were consumed with roughage and all. People began to eat sugar beet-roots and even tulip bulbs. The lack of coal and wood made heating of the houses and hospitals impossible. There was no gas, no electricity; the cities were dark at night, cooking was done on small primitive stoves with the little wood or coal one could get.

What was the effect of the occupation and its influence on the diseases which concern us at present? The first years of the occupation brought a large increase in the incidence of peptic ulcer. This was ascribed by most physicians to the shortage of milk and cream, and to the increasing amounts of vegetable food and roughage in the diet. We pointed out that at the same time the population was living under an enormously increased emotional strain, and that a similar increase in the frequency of ulcer occurred in the allied countries where no change in nutritional habits had taken place. The further course of events, however, soon proved which of the two factors, coarse food or emotional tension was the most important, for when later in the war the real famine appeared, a remarkable improvement in the ulcer situation occurred! In spite of the fact that the food situation was much worse, and that the population, including ulcer patients, had nothing to eat but sugar beet-roots, potatoes with the peel, coarse bread, and tulip bulbs, our ulcer patients experienced an amazing relief of their symptoms.

Now it cannot be said that during these last months of the occupation, we had nothing to worry about. There certainly were enough emotional upheavals, but the nature of these emotional disturbances were entirely different. In the first years of the occupation Germany was at the height of its power, and the outlook for liberation seemed very dark. During these years the fear of deportation or imprisonment, the strain and hazards of those who participated in underground resistance, the decline of business for those who did not wish to collaborate in the German war effort, the necessity of keeping everything one said or did secret, the constant frustration of having to tolerate acts of gross injustice, performed before our eyes, had been an almost unbearable strain. With all this, the men, in particular, tried to save face, and behave as though they were unafraid and undisturbed, whereas they were under great, but suppressed tension.

When the famine came, much of this changed. To begin with, everybody

knew that Germany was virtually beaten; the allied army had reached our southern frontier and nobody doubted that our liberation was only a question of months. The underground resistance was now much better organized and armed and, not taking too many risks, waited its time to assist in the coming allied offensive. Most prevalent now were the emotional disturbances caused by hunger; the primary urge was to obtain food. Moreover, the social structure of our society had entirely changed. People did not go to their work any more: what was the use of working when you could buy neither food nor clothing nor fuel with your money? A man who had until now been tense under a difficult situation at his job, for fear he might be dismissed and then drafted to Germany, now came in only twice a week and his boss would be very happy if he would give him the name of a farmer who could provide him with food. No gratification can be compared to what we experienced, when we brought home a sack of potatoes on our bicycle after a "hunger trek" of several hours. No man was ever so highly admired by his wife as when he brought food for her and the starving children. Moreover, the sexual urge diminished with starvation, and with it certain marital difficulties seemed to lose their importance. The extraordinary situation arose that doctors saw their ulcer patients ride bicycles for hours or walk miles at a stretch, carrying heavy loads, discarding their diets, eating everything they could lay their hands on, and witnessed healing of ulcers, which had resisted long periods of bed rest, carefully planned diets, and the most divergent form of medical therapy.

Inside the concentration camps the same phenomenon occurred; peptic ulcer became an extreme rarity. Again there was plenty of reason for emotional swings amongst the prisoners. There was the constant fear of being transferred to a worse camp, the real fear of being put to death by gas in some camps, the threat of torture in others. There was hunger, homesickness, despair, there was aggression, very often directed to the fellow prisoners, but all these emotions were expressed freely. Further the life of the prisoners was rigidly regimented; everything was prescribed by force or immediate bodily punishment; nothing was left to responsibility, duty or conscience, and this did away with many inner conflicts which make life in a democratic society difficult. Neither did ambivalence of feelings upset the prisoner's minds: In the camp one divided one's fellow men into enemies, whom one hated, and into friends to whom one stuck. There was very little attempt at saving face, and there was nothing of this peculiar inhibition of tension which is a typical feature of our complicated current social relationships. Life in concentration camps was cruel and threatening, but, emotionally of a peculiar simplicity.

Asthma showed the same picture as ulcer. Several of the author's asthma patients were apprehended and shipped to concentration camps. To their own amazement their asthmatic attacks stopped completely at the moment of their arrest, and sometimes disappeared during their internment, only to recur shortly after they returned to Holland on their liberation. One patient, an underground worker, was arrested in the midst of an attack. He was taken to a prison which was only a few blocks away from where he lived. By the time he arrived there

his attack had ceased. This patient who invariably had severe attacks when walking against the wind, tried later, when he was in a concentration camp in Holland, to escape transfer to another camp in Germany by running against a strong wind. This had never failed to cause an attack, but this time he was unable to produce one at will. Here again the emotional situation was different from that under which he lived at home. The suppressed irritation, caused by something his mother said or did, or the restrained dismay evoked by adverse circumstances in his former life, were entirely different feelings from the deadly fear for the future which German cruelty inspired in him.

I vividly remember one Jewish patient with moderately severe ulcerative colitis; before and during the onset of the war, while he was still living a free life in Holland, his disease lingered on and resisted medical measures. Transferred to a transit camp, his disease cleared up completely, and later, when he was deported to Bergen Belsen concentration camp, he actually had less diarrhea there than most of his fellow inmates. The emotional situation in this patient had been largely connected with his marital difficulties. He resented his wife's domineering attitude towards him, and he also felt that her sexual demands (he was often impotent) were against his ideals of married partnership. In the transit camp (where men and women were confined together, but slept in separate barracks) his wife got a job in the kitchen. She took excellent care of him, provided him with extra food, and as they slept separately, sexual difficulties were no longer disturbing emotionally. "In the camp my wife was like an angel to me" he said, "as she had never been before". Later, when he returned to Holland, he had a recurrence of his disease, when emotional problems recurred.

Migraine and hyperthyroidism are among other diseases, that disappeared during the famine and within concentration camps. It is rather significant that hyperthyroidism like gastric ulcer increased in incidence during the first war years, when food was still obtainable, and the strain situation was as described. However, during the famine, the only 2 cases of hyperthyroidism the author saw, were in German women who had plenty to eat, but were under great strain because their sympathies (and in one of them her actual cooperation) were secretly with the Dutch, so that they felt estranged from their own environment without finding adequate compensation from the Dutch, who still distrusted them. Hypertension did not disappear, although many of our hypertensives experienced a considerable drop in their blood pressure. It was difficult, however, to say if this, too, was the result of a changed emotional attitude or mainly due to loss of weight.

This decrease in frequency, and even cure of peptic ulcer, asthma, and ulcerative colitis under conditions which involved unfavorable physical and emotional conditions but, of a different type than those under which the patients had been living before, so that as a result the patients were in a different "feeling" state, seems to fit in well with the concept of a *specific* casual relationship between certain states of unexpressed tension, and the production of certain disorders of psychosomatic origin.

That there exists a relationship between life stress, emotions, and disease has been known to physicians for centuries. Further progress has been made in our understanding of the mechanisms along which this relationship manifests itself. However, an immense field still remains for further research, a field in which not only psychiatry, but almost every specialty in medicine can make its contribution, and where even the general practitioner (almost forgotten among the research workers of our days) can make an important contribution by recording carefully his observations on his patients in their usual environments. Certainly, psychosomatics is no field for those who find it easier to talk than to work. Neither is it a field where one school of approach or therapy should claim exclusive territorial rights. The principles of controlled observation, planned experimentation, objective registration, and statistical interpretation, which have brought medicine to its present level, should also guide us in our explorations in this new field. And let us hope, that another 14 years from now, a young physician would not have to hesitate, as I did, when Dr. Gregg would ask him the same question he put to me in 1936: "How would you use exact methods in the study of the role of emotional factors in the etiology of internal diseases?"

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AN EXPERIMENTAL STUDY OF THE EFFECT OF AUREOMYCIN UPON THE CIRCULATION OF THE INTESTINE SUBJECTED TO VASCULAR INJURY*

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Sir Heneage Ogilvie, in a warning against the cult of the new in science (1) says, "Another instance in which we may be led astray is in regard to surgery of the colon. The new sulfonamide drugs can sterilize the intestinal contents. Have they thereby made one stage anastomosis any safer? Many have assumed this; but infection is only one of the dangers that beset such an operation. The thinness of the colon walls, the fat blisters that distort them and hinder exact apposition, their poor blood supply, the alternating solid and gaseous nature of the contents, and the explosive force with which they are shifted along at infrequent intervals by mass peristalsis are all factors that remain untouched by chemotherapy. If only a few patients die from leakage after one-stage resections, we may be well advised to consider whether this advance was well-timed, or whether we should not leave this forward observation post and return to our main lines."

This statement does not take into account several published experimental studies showing that an otherwise fatal vascular injury to a loop of intestine will heal under appropriate chemotherapy (2, 3, 4). In the experimental data which follow, this observation is amply confirmed and the mechanism of action of the antibiotic elucidated.

MATERIAL AND METHOD

The experiments were performed on dogs. In each case a 35 cm. loop of lower ileum in continuity was subjected to vascular injury. Three types of injury were studied: division of all veins or of all arteries, or of both, several inches proximal to the mesenteric border of the loop. The marginal vessels at both ends of the loop were also divided. In addition, the mesentery at both ends of the loop was divided along the axis of the vessels from the border of the loop to the root of the mesentery. The only remaining vascular connections were the mural vessels at both ends of the loop and such invisible collaterals as were present in the mesentery. Each type of injury was produced in fifty dogs.

The effect of aureomyein glycinate on the local process resulting from each type of vascular injury was studied as follows: The first ten of each group of fifty dogs received no drug, the second ten received 1.5 Gm. in two equal doses daily before injury, until *E. coli* was absent from stool cultures; the third ten received the same amount daily for five days after injury; the fourth ten received 100 mg. into the lumen of the loop at the

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time of injury; and the fifth ten received the drug intravenously in the maximum dose that could be tolerated, i.e. $12\frac{1}{2}$ mg. per kilo twice daily.

The bacterial flora of the loop and of the peritoneal cavity was determined at the time of injury and at death. Animals which survived the injury were sacrificed on the 21st day and the flora was again determined.

The details of the process of revascularization were observed by injection of thorotrast, at a pressure 100 mm. of Hg, into a vein or artery or both at the root of the mesentery of the excised loop, or, in some instances, into a vein in the omentum, which was always found enveloping the injured loop. In addition, histologic study of the loop at intervals up to 48 hours following injury was made.

RESULTS

The survival rates, as shown in Table I, are such as to leave no doubt of the therapeutic effectiveness of oral aureomycin. That nutritional disintegration is due largely to bacterial invasion from the lumen of the gut follows from the observation that death, which occurs within an average of 40 hours in untreated animals, usually can be prevented in the less severe types of injury by oral aureomycin. The rapidity of the action of the drug is demonstrated by the fact

TABLE I
Survival Rates in Vascular Injury of Small Intestine

TYPE OF INJURY	UNTREATED	TREATED WITH AUREOMYCIN			
		Before Injury	During Injury	After Injury	
		Oral	Intra-luminal	Oral	Intra-venous
Venous Ligation and Division.....	20%	70%	80%	100%	60%
Arterial Ligation and Division.....	20%	80%	40%	90%	40%
Arterial and Venous Ligation and Division	30%	40%	30%	60%	50%

that the best results are obtained when it is given at the beginning of this forty hour period. The protection afforded by one dose of 100 mg. placed in the lumen of the loop at the time of producing venous occlusion is remarkable.

These results contrast with the weak action of the drug given intravenously. My colleagues and I have observed precisely the same difference in therapeutic effectiveness of the drug given by these routes in experimental appendiceal peritonitis (5, 6) and, more recently, in studies on the control of the Welch bacillus infection which appears to be responsible for the death in experimental acute hemorrhagic pancreatitis (7). This difference can be explained in two ways: 1) Aureomycin given intravenously is toxic in dogs and will cause death in healthy animals if continued for several days, particularly if given in excess of the dose used in these experiments. 2) With the dose used, the antibacterial effect upon the flora within the intestine is distinctly inferior to that of the drug given orally. Since that part of the drug given orally which is absorbed may be expected to achieve no more than if it were given parenterally, the superiority of the oral route must be ascribed to the local action of the drug, i.e. to the

bacteriostatic effect upon the intrainestinal flora. In experimental appendicitis we dealt with bacteria deliberately introduced into the peritoneum from the intestine. In experimental pancreatitis the Welch bacillus is present from the beginning as a normal inhabitant of intestine, liver and pancreas. The normal reaction of defense may be expected to deal successfully with an initial bacterial contamination. But the protective resources may be exhausted if bacteria from the intestine continue to invade. This occurs not only as a result of a perforation of the intestine: a severe inflammatory reaction by itself may excite invasion by transmural migration (8). Hence, in circumstances involving continuing contamination from the gastrointestinal tract, the oral route may achieve a result which is superior to the parenteral route (5, 6).

In extreme degrees of vascular injury, as in occlusion of both arteries and veins, the suppression of bacterial action does not assure preservation of nutritional integrity, presumably because the reduction in revascularizing potential is too severe.

The immediate local effects of vascular injury vary with the type of occlusion produced: Immediately after *venous occlusion* fine thread-like veins appear in the mesentery distal to the site of division. The same area swells and becomes infiltrated with extravasated red cells. The loop becomes cyanotic and then hemorrhagic and its lumen fills with blood. Eighteen to twenty-four hours later the loop is dark red to black, covered with fibrin and omentum. Some 100–150 cc of bloody fluid are in the peritoneal cavity. The arteries as well as the veins distal to the ligatures are filled with clot. If the dog succumbs, usually within 40 hours, the loop is necrotic and there is frank peritonitis. If antibiotic therapy has been given, or if the loop has managed to survive without it, the loop after 24 hours is brick red to dark red and there is little or no free peritoneal fluid. The degree of edema and hemorrhagic extravasation in the wall and the mesentery is distinctly less than in the untreated loop and the occluded vessels contain liquid blood as well as loose clot. Minute vessels appear in the mesentery, forming a rich anastomosing plexus.

Surviving loops are always completely enveloped by omentum, which is fixed to the mesentery and loop precisely to the limits of the involved tissue and not beyond. When examined several weeks later, the loops are thicker and shorter than normal, the lumen is narrowed, and there are residual islands of extravasated red cells.

Loops subjected to *arterial occlusion* behave differently in some respects. There is little or no hemorrhagic exudate. Necrosis and perforation occur and death results within 24–48 hours. The appearance of loops several weeks later is much the same as in venous occlusion, except that they are usually deformed into the shape of a U or V. The mesentery is contracted into a roll within the loop.

Loops deprived of both *arterial and venous supply* display the same changes observed in loops with venous occlusion, but in addition develop perforations like loops with arterial occlusion. Death occurs within 48 hours if the loops do not survive. Surviving loops heal much like those with arterial occlusion.

The process of revascularization of a loop subjected to vascular injury is best revealed by x-ray studies of the vascular pattern of the excised loop at successive intervals following the injury. The normal pattern, depicted in Figure 1, shows the mural plexus and the marginal vessels as well as the mesenteric vessels. Films taken at intervals during the first 24 hours following obstruction to venous return show progressive occlusion by clot of the veins distal to the ligatures, spasm of the accompanying arteries, followed by their occlusion with clot. The mural vessels do not fill from the patent vessels of adjacent healthy gut. No distinction between treated and untreated loops is apparent for the first twelve to eighteen hours. In the 24 hour films, however, a marked difference is evident. None of the arteries or veins of the untreated loop are patent, whereas many or most of the vessels in the treated loop are patent and the mural plexus



FIG. 1. Normal loop of ileum. Vessels visualized by injection of thorotrast in vein in root of mesentery. Note retrograde filling of arteries and pattern of intramural vessels. Localized areas of extravasated dye due to mechanical injury.

is filled. These differences are shown in Figures 2 and 3, in which the untreated loop appears dilated and with indistinct borders. In the treated loop the patency of the veins distal to the ligatures signifies dissolution of the clot present during most of the preceding 24 hours.

Figure 4 shows the vascular pattern of a loop 48 hours after venous occlusion. The richness of the network of fine vessels bridging the site of division is such as to suggest that they are newly developed collaterals. Study of films taken at successive intervals for several weeks thereafter demonstrates five sources of collateral supply: 1) the bridging arcades seen in Figure 4; 2) new vessels running the full length of the mesentery (fig. 5); 3) small collaterals from the walls of adjacent adherent loops to the walls of the injured loop (fig. 6); 4) from the mesentery of adjacent healthy gut to the mesentery of the injured loop; and 5) from the omentum to the wall and mesentery of the injured loop (fig. 7).



FIG. 2. Treated loop twenty-four hours after division of veins. Note restitution of patency of veins, arteries and intramural vessels. Collaterals to adherent omentum, if present at this stage, cannot be identified by this method. Note distinctness of outline of loop in contrast to loop in Figure 3.

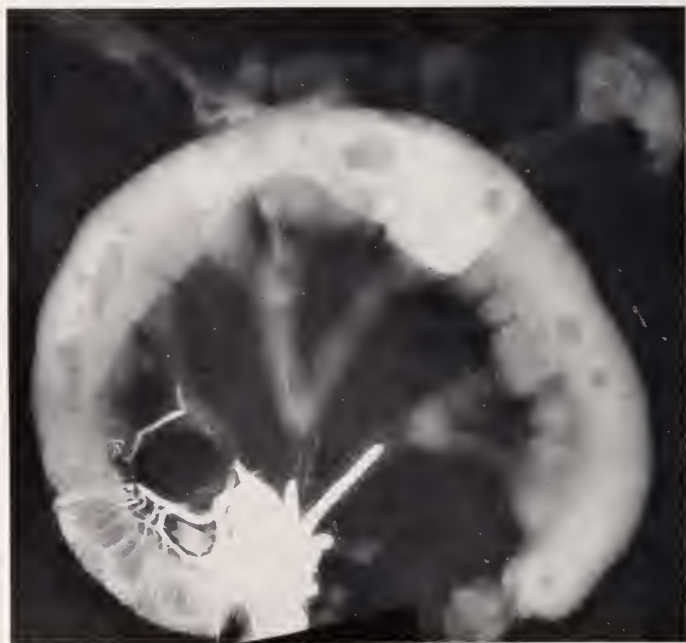


FIG. 3. Untreated loop twenty-four hours after division of veins. Loop necrotic and surmounted by plaque of fibrin. Occlusion of veins and arteries in mesentery.



FIG. 4. Mesentery of treated loop 48 hours after division of veins. Note rich collateral network bridging the gap.



FIG. 5. Surviving loop 19 days after division of veins. Note cord of new small vessels running full length of mesentery.



FIG. 6. Surviving loop eleven days after arterial occlusion. Note collaterals from adherent healthy loops.



FIG. 7. Surviving loop of ileum twenty-one days after dividing veins and arteries to the loop. Note direct communication between omental and mesenteric vessels.

Sources 3 and 4 are of minor consequence. The richness of the supply from new vessels or bridging arcades in the mesentery is variable from slight to considerable. But the flow from the omentum is not only a constant feature, but is uniformly rich. The circulation of the loop and mesentery fills as well and as readily whether the injection is made *via* the omental vessels or those in the mesentery. In most cases the anastomoses connect the omental vessels to the mural as well as the mesenteric vessels.

Since all surviving loops are found completely enclosed by adherent omentum, an effort to establish the importance of the omentum in the revascularizing process was made by excising the entire omentum, in a group of 12 dogs, at the time of injuring the loop. All twelve received aureomycin. Ten dogs died, a survival rate of 20 per cent as compared to 70 per cent in experiments with omentum intact. Recovery from otherwise fatal experimental peritonitis of appendiceal origin is effected by aureomycin even when the omentum is absent (5). This suggests that recovery from vascular injury treated with aureomycin does not depend on the omentum acting as an organ of defense against infection, but rather as an almost indispensable source of collateral circulation.

The local fluid loss is largely due to bacterial action rather than to the mechanical effects of vascular injury. This follows from these facts: The loss is trivial in arterial occlusion; there is much less blood in the lumen of the treated animals; and the bloody fluid in the peritoneal cavity in the treated animal with occlusion of the veins or of the veins and arteries is almost zero as compared to 100-150 cc in the untreated animals with such injuries.

The amount of peritoneal fluid in the untreated animal suggests that peritonitis may be a substantial contributing factor in the lethal outcome. For two of three dogs with venous occlusion and two of three with arterial occlusion survived when aureomycin was given intraperitoneally. It is possible that the peritonitis is harmful not so much because of its constitutional effects as because of local interference with the establishment of collateral channels between omentum and the injured loop.

There is little doubt from the foregoing data that the capacity for revascularizing a loop of intestine with a marginal or submarginal blood supply is adequate if the superimposed burden of bacterial action can be obviated.

The mechanism by which the antibiotic conserves the nutritional integrity of the injured loop is demonstrated in microphotographs of sections from treated and untreated loops at varying intervals during the first twenty-four hours after injury¹. The tissues of the untreated loop with venous occlusion show a considerably greater degree of damage to the capillaries, arterioles, venules and veins (figs. 8, 9). Progressive occlusion by clot and then by thrombus occurs in the smallest vessels and finally in large veins (figs. 10, 11). There is intimal necrosis of all small vessels and veins. Intravascular hemolysis of red cells is widespread. Progressive disorganization of all layers is accompanied by necrosis of cells in the walls of the veins as well as the muscle layers. The inflammatory

¹ We are indebted to Dr. James Goddard for the microscopic studies. More detailed data are published elsewhere (9).

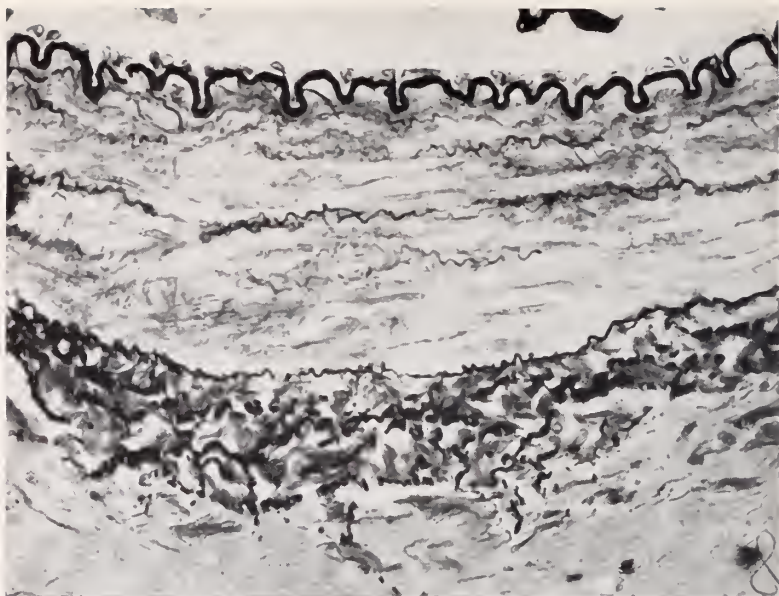


FIG. 8. Eighteen hours after venous ligation. No antibiotic. High-dry power (800 \times) of mesenteric arteriole. Intima is intact. In the media, however, the smooth muscle fibers are swollen and their myofibrils appear indistinct. The ruptured elastic fibrils show a spiral pattern. Collagenous fibrils in the adventitia are broken and run in various directions.

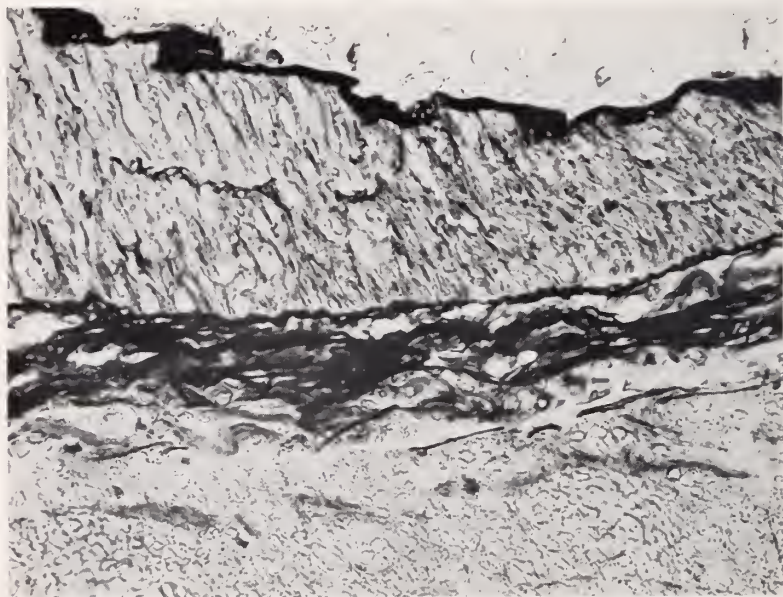
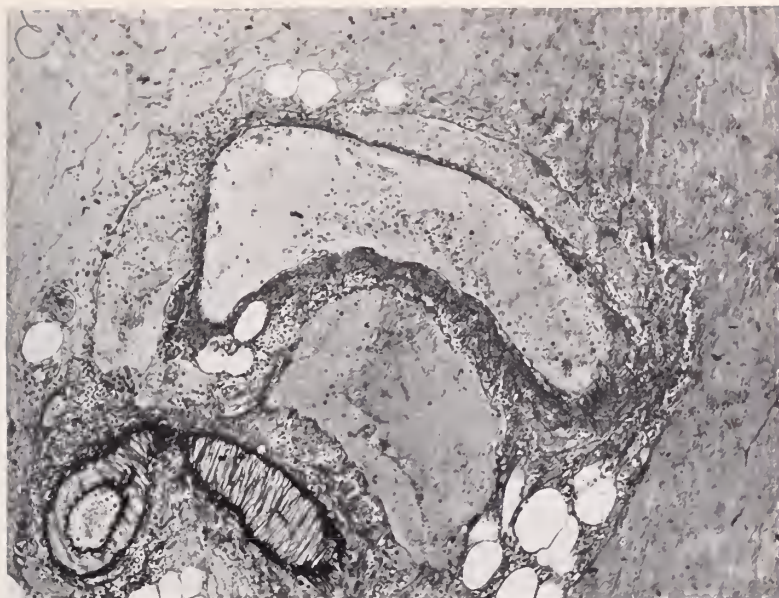


FIG. 9. Eighteen hours after venous ligation. Antibiotic given. A mesenteric arteriole of a calibre identical with that of Figure 8. Structural details in the media are well preserved. The intervening elastic fibrils are not ruptured. The connective tissue bundles and elastic fibers of the adventitia show a minimum of dissociation and, on the whole, are within normal histologic range.



[FIG. 10. Low power microphotograph (180 \times) of the mesenteric attachment 24 hours after venous ligation. No antibiotic given. Veins and distended capillaries show obliterating thrombi. Minimal perivascular reaction. Interstitial fibrin deposit and distortion of structure of fat tissue.

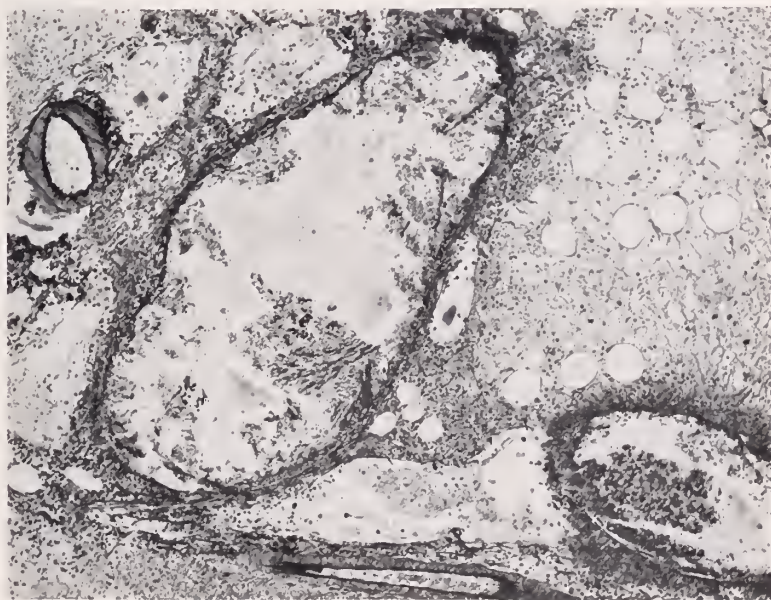


FIG. 11. Low power microphotograph (180 \times) of the mesenteric attachment. 24 hours after venous ligation. Antibiotic given. Lumina of veins are being cleared. Perivascular reactivity is more intense than in the untreated loop (Figure 10). Hemorrhagic extravasation is less and fat tissue less disturbed.

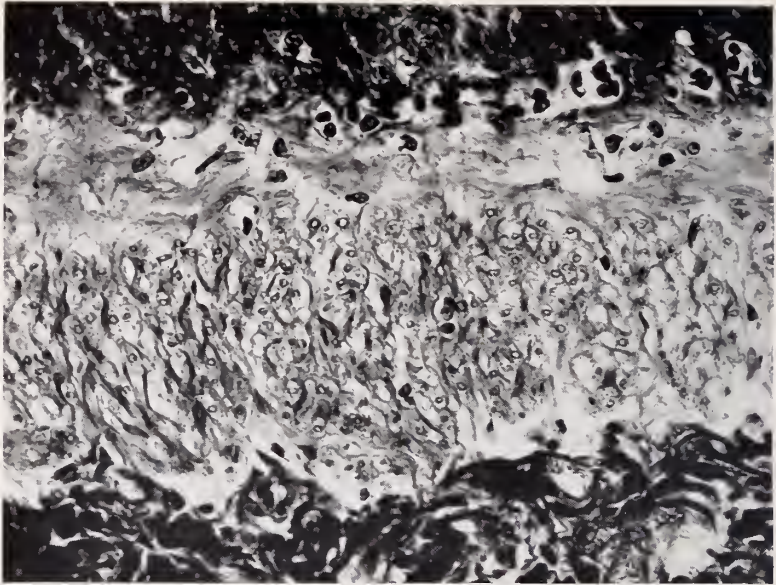


FIG. 12. Muscularis mucosae 18 hours after arterial occlusion. No antibiotic given. Compare with Figure 13. Shrinkage of the muscle cells with early collapse fibrosis. Some of the replacement fibers are coarse. Circular layer indistinct, with few nuclei visible.

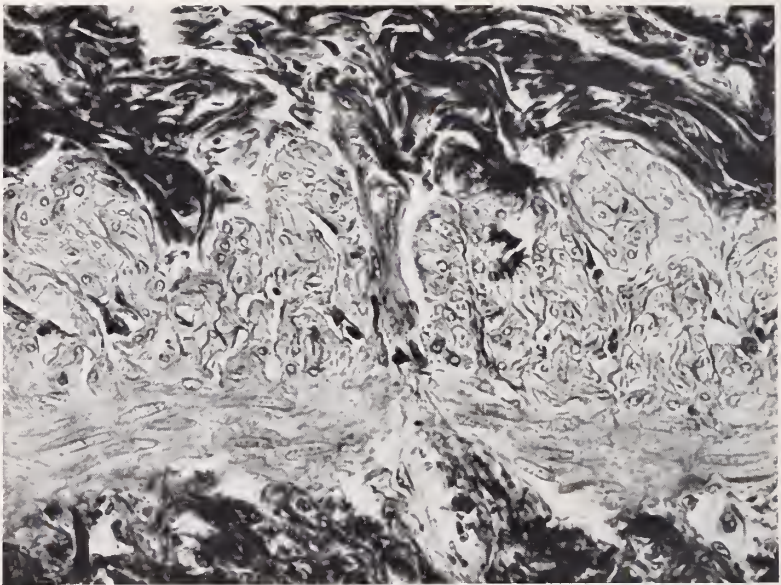


FIG. 13. Muscularis mucosae eighteen hours after arterial occlusion. Antibiotic given. Compare with Figure 12. Nuclei and all structural details are normal. There is no evidence of collapse fibrosis, the intermuscular collagenous fibrils being within normal histologic range.

response is feeble. By contrast, in the treated loop the occlusion of vessels by clot or thrombus in the early stages is halted and recanalization is in progress

after the 12th hour. The intravascular and perivascular cellular reaction to injury is more vigorous. Necrosis of cells in vessel walls and in muscle is minimal. Edema and disorganization of the various layers of the gut is distinctly less than in the untreated loop (figs. 12, 13).

Rough quantitative measurements show that the number of open vessels and of viable nuclei in comparable tissue sections is distinctly greater in the treated loop, which also shows a greater migratory cell response to the injury.

In general the differences between treated and untreated loops with arterial occlusion are the same as those for venous occlusion. The response to injury, as displayed by arterialization of capillaries, scavenger and inflammatory reaction, recanalization and intimal proliferation, is vigorous in treated loops and feeble or absent in untreated ones.

The effect of bacterial activity consists of an aggravation of the degree of vascular occlusion and an obliteration of nascent collaterals, so that tissue viability is destroyed.

Bacteriologic data² from cultures of the lumen of the loop and peritoneal cavity of animals which succumb, compared to similar data in animals which survive and are later sacrificed, yield no conclusive evidence that any given bacterial strain is responsible for the conversion of a marginal or submarginal to an inadequate blood supply. The fact that the bacterial injury appears to consist primarily of intimal damage and hemolysis of red cells suggests such bacterial species as the streptococcus hemolyticus or the Clostridia. Detailed analysis of the incidence of the various flora recovered fails to impugn any particular species (9). Since most intestinal antibiotics, having differing spectral ranges, are more or less effective in forestalling necrosis of injured loops, it is possible that several species acting symbiotically are implicated in the process.

COMMENT

The types of vascular injury utilized in this study are, of course, remote imitations of disease. Nevertheless, they should be valid tools for the study of the natural biologic response to deficiency of flow in the gut, however produced. The crucial role of the omentum in mobilization of collateral flow in the dog may or may not be valid in man. But a similar if not equal potential exists in man, e.g. the ability of omentum to heal gastric or duodenal perforations which cannot be sutured, and the vascularity of omental adhesions to injured intraperitoneal structures.

Apart from these considerations, there can be little doubt of the desirability of suppressing bacterial action in conditions in which the intestinal circulation is at a marginal or submarginal level. The surgeon will not leave nature to deal with such a situation when it is clearly recognizable and the patient is in a position to tolerate the trauma of operation. But there are many circumstances in which he cannot intervene, or, having intervened, is unable to assess the deficiency or to correct it. Indeed his own surgical procedures sometimes fail because of ischemic necrosis at a suture line from the unanticipated development of tension or edema.

² We are indebted to Dr. Fritz Schweinburg for obtaining these data.

CONCLUSIONS

Oral aureomycin facilitates the reestablishment of adequate blood flow in a loop of the dog's intestine subjected to vascular injury. If no antibiotic is used, the degree of vascular injury is sufficient to result in gangrene and death within 40 hours. Recovery and return of function occurs nearly always if aureomycin is given orally before or after producing either venous or arterial occlusion, but not if both arteries and veins are occluded. Aureomycin given parenterally provides only meager protection. Revascularization and survival of the loop is facilitated by inhibiting the normal intestinal flora, which, in the untreated animal, impedes the development of collateral circulation.

We are indebted to Dr. James Goddard for the pathological data and to Dr. Fritz Schweinburg for the bacteriological data included in this report

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CONSERVATIVE SURGERY OF THE MANDIBLE

REPORT OF FIVE CASES*

LEO STERN, JR., D.D.S.

The progressive developments in any highly specialized field rarely gain the full attention of those whose practice lies in adjacent or overlapping fields. For example, many fundamental improvements in the treatment of large osteolytic lesions of the jaws are not widely known outside the field of oral surgery. Yet problems involving such conditions are often referred to the internist, general surgeon or surgical specialist. A review and discussion of the concepts underlying the modern approach to these diseases may therefore be of general interest.

The oral surgeon has been notably successful in the development of a conservative management of benign intra-osseous lesions, especially the odontogenic cyst, to such a degree as to preserve not only continuity of bone, but also the implicated teeth. Improvements in surgical methods have resulted from special techniques such as oral roentgenography, local anesthesia and root canal therapy, as well as from an increased knowledge of the histopathology of teeth and oral structures (1).

THE ODONTOGENIC CYST

The odontogenic cyst is one of the commonest rarefying lesions of the jaws. There are two varieties of this lesion which should be distinguished: namely, the follicular cyst and the radicular cyst. The *follicular cyst* arises from the epithelium of the enamel organ about the developing tooth (fig. 1a). The stage of development at which cystic change takes place in the follicle will govern the degree of tooth maturation in the clinical lesion. If the cyst forms at an early stage of odontogenesis, that is before solid structure is laid down, there will be no tooth associated with it. If it begins at a later stage, a partly formed crown or a completed tooth may be found within the cyst or adjacent to the cyst. Most frequently the follicular cyst occurs in the mandibular third molar region and is unilocular. The *radicular cyst* is produced by epithelial proliferation of rests found in the periodontal membrane (debris of Malassez). It is the result of stimulation by bacterial toxins draining from an infected root canal of a cariously or otherwise devitalized tooth (fig. 1b). It is therefore inflammatory in origin, but may nevertheless persist after the causative tooth has been removed.

Clinical symptoms of the odontogenic cyst are generally absent until expansion of the cortical plate of bone occurs or infection supervenes. Bone may become thinned to parchment consistency and yield a crackling sound on pressure. Pain or paresthesia of the lip sometimes ensues from pressure on the inferior alveolar nerve, but this does not indicate infiltration of the nerve. Similarly, teeth are often displaced by pressure but seldom show resorption of the roots. Histologically the cyst comprises a layer of compact bone surrounding a cyst sac of fibrous

* From the Dental and Oral Surgery Service, the Mount Sinai Hospital.

connective tissue, lined by epithelium ranging from low columnar to stratified squamous (fig. 2). The fluid content may be clear and straw-colored with an

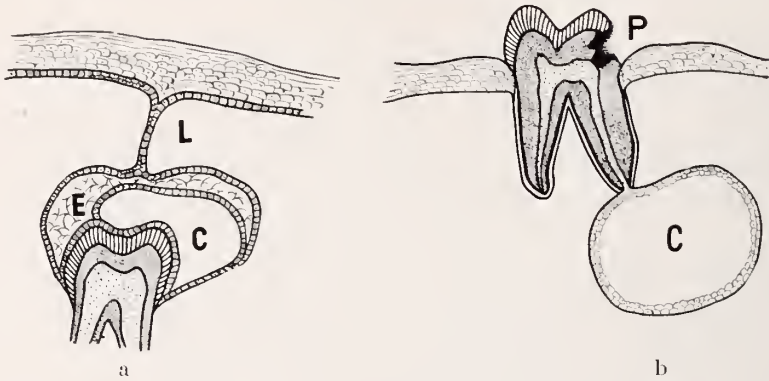


FIG. 1. Pathogenesis of Dental Cysts: Schematic Illustration

a. Follicular cyst. The enamel organ (E) or the disintegrated dental lamina (L) forms the site of proliferation of the cyst (C), usually during the development of the tooth.
b. Radicular cyst. A cariously involved and necrotic pulp (P) gives rise to a granuloma, which undergoes epithelial proliferation to form a cyst (C).

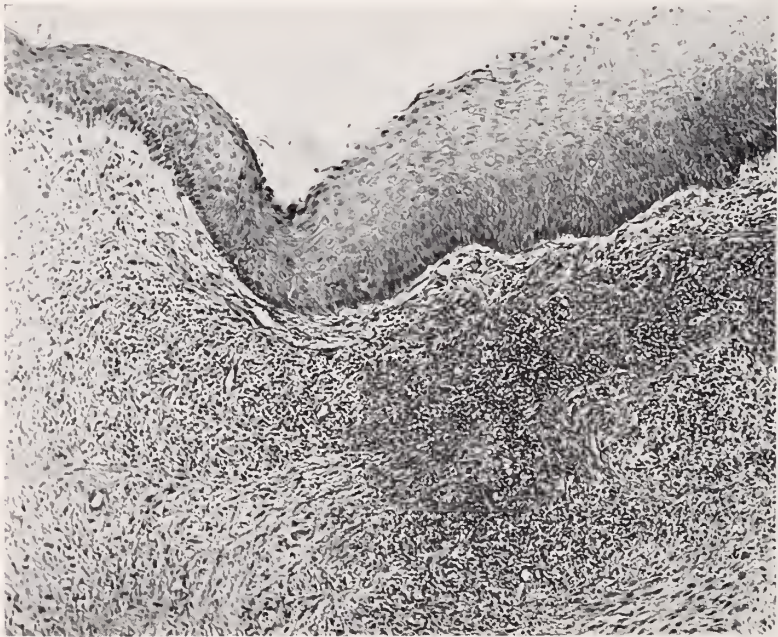


FIG. 2. Histopathology of follicular cyst (Case 2). The stratified squamous epithelium and underlying connective tissue are easily separable from bone. There is no resemblance to ameloblastic cells (cf. ameloblastoma in Figure 4).

iridescent sheen imparted by cholesterol crystals, or thick and "cheesy" from degenerated epithelium and hemorrhagic debris.

Diagnosis of an odontogenic cyst may sometimes present difficulty. It must be

differentiated from the other benign cystic lesions found in the jaws: the facial cleft or fissural cyst and the hemorrhagic or traumatic cyst. Other rarefying lesions to be excluded are ameloblastoma, benign giant cell tumor, localized osteitis fibrosa and generalized osteitis fibrosa of hyperparathyroidism (2). The invasive neoplasm should seldom be mistaken for a cyst, which is usually distinguished by an encapsulating layer of cortical bone in the roentgenogram. This feature, however, is lacking in the case of the hemorrhagic cyst or in cysts secondarily infected. A unilocular, encapsulated appearance rules out most tumors, but occasionally the ameloblastoma presents the same picture. On the other hand, a follicular cyst may be multilocular and closely resemble the ameloblastoma.

Adequate diagnosis is impossible without a knowledge of dental structures and use of electric pulp testing. The vitality of teeth and their roentgenographic appearance often furnish the clues as to whether the lesion is inflammatory, invasive or merely expansive. Complete roentgenographic studies should be routine, including lateral oblique plates of both sides of the mandible or maxilla; anteroposterior plate where indicated, as well as views of the ascending ramus or articulation; and an antraoral survey with interdental films and an occlusal film (fig. 14). Only in this way can fine detail be evaluated. Besides clinical inspection, roentgenograms and pulp testing, it is often necessary to confirm the diagnosis by aspiration, biopsy, or both.

Surgical management of odontogenic cysts embraces two principal methods:

1. Complete enucleation, with or without primary closure.
2. Marsupialization, or elimination of the cyst by removing the outer portion and producing a continuity of the cyst lining with the mouth.

Marsupialization (the Parns operation) is generally suited to cysts of the soft tissues such as ranula, and to cysts of bone where one wishes to preserve the integrity of neighboring structures such as the maxillary antrum or functioning and vital teeth. It is subdivided into two technics: in the first, the inner membrane is allowed to remain and joins with the mucoperiosteum at the periphery of the excised portion. In the second, the entire membrane is removed and a mucoperiosteal flap is turned into the cavity to become attached to the inner wall (3). The chief disadvantage of marsupialization arises in large cystic lesions, especially of the mandible, where filling of the defect is slow and usually never complete. This leaves a recess in which food collects and is a permanent source of annoyance. The disadvantage is unimportant if a large number of teeth can be preserved.

Removing all cystic membrane and packing to permit granulation brings more rapid resolution and is preferred for larger mandibular cysts provided one does not have to sacrifice too many serviceable teeth. The age of the patient is also a factor. Primary closure of maxillary cysts is often successful, owing to relatively good vascularity of bone as compared with the mandible. In the lower jaw, however, because of contamination by saliva, poor blood supply, or other reasons not fully known, the initial blood clot usually breaks down. More recently it has become possible to secure primary closure under antibiotic therapy, using fibrin foam, oxidized gauze, or other absorbable material to fill dead space.

Enucleation of a mandibular cyst is *always an intraoral procedure* and is most satisfactorily performed under local procaine conduction anesthesia. Treatment should always be conservative with respect to both bone and teeth. Even those teeth which apparently are hopelessly involved will respond positively to the electric pulp tester; these are vital and must not be sacrificed. Where surgical dissection may encroach on the roots and cause their death, root canal therapy will preserve most teeth. It is good practice, however, to avoid this necessity by a two-stage operation whenever roots are contiguous with the cyst. The first step consists of fenestration; that is, creating an aperture in the cyst a centimeter or two in diameter, displacing the contents by irrigation, and packing the cavity lightly with gauze dressing. Since the pressure of the cystic fluid is relieved, there will be a steady regression in size which can be followed by roentgen examination.

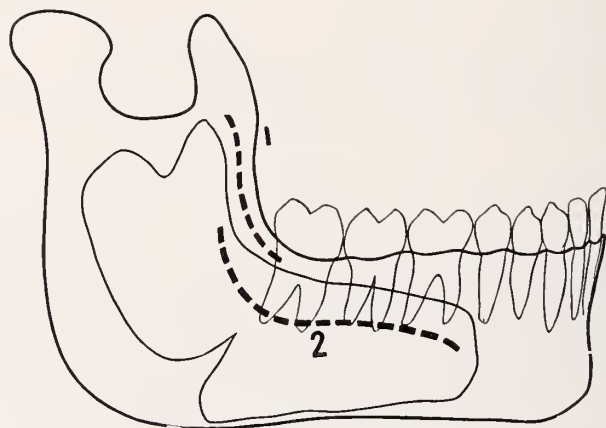


FIG. 3. Enucleation of Follicular Cyst

Incision 1 represents the first stage of the surgical procedure described in Case 2. This permitted removal of the upper half of the cyst, with shrinkage of the remaining portion until the molar roots were safely protected. The second stage, incision 2, completed the enucleation. Flap retraction was away from the teeth.

After the teeth are well surrounded by bone, the operation is completed (fig. 3). The cystic membrane is dissected free from its bony walls, carefully preserving the teeth, mandibular and lingual vessels and nerves. After smoothing the bony edges, the wound is closed with interrupted sutures, leaving an aperture through which vaseline or iodoform gauze packing may be inserted to fill the cavity loosely. Granulation tissue will fill the defect within a few weeks, and calcification is usually well advanced within six months.

Complications are neither serious nor common. Signs of post-operative infection are seldom seen, in spite of contamination by saliva. Penicillin therapy and simple drainage are sufficient to control any acute reactions should these occur. Pathologic fracture is likewise rare but is best anticipated by intermaxillary fixation in the form of wiring, or acrylic or metallic dental splints.

BENIGN TUMORS, DIAGNOSIS AND TREATMENT

Since the conservative technique described for odontogenic cysts is both dependable and without serious sequelae, it is employed with slight modification for the majority of benign, well-encapsulated growths of the jaws, as for example the fibromas and odontomas. *Extraoral surgery is never indicated*, although case reports describing resection of the jaw for such lesions are still seen in the literature. There is another group of tumors comprising diffuse overgrowths such as hyperostoses, exostoses, fibrous dysplasias and many osteomas, which are apparently related to trauma, irritation, or endocrine factors and follow a slow growth, eventually reaching a state of arrest. Treatment should therefore be cosmetic and not prompted by fear of extension. A third category of benign neoplasms, including the ameloblastoma, myxoma, and giant cell tumor, are poorly encapsulated and are liable to recur after local curettage, since peripheral portions of tissue are not extirpated. The problems of therapy in this group are discussed separately.

The early detection of malignancy is, of course, essential for the most favorable cure rate. Overzealous diagnosis, however, with incorrect appraisal of the benignity of jaw tumors, has contributed all too frequently to the needless loss of a mandible, leaving a permanently disfigured patient. Resection of a portion of the mandible, which is indicated in most operable carcinomas and sarcomas of this region, is a crippling defect which cannot be dealt with satisfactorily by bone implants or prostheses. The bone graft succeeds only in some defects where there is a posterior fragment remaining. Where this is absent, the hemisectioned mandible assumes a deviated position due to the pull of the pterygoid and mylohyoid muscles. This cannot be restored functionally, although to a limited extent a prosthetic appliance may improve contour and enhance the cosmetic result.

Where malignancy is suspected, the diagnosis must be confirmed before radical operation. Waldron (4) calls attention to numerous tumors which were labeled osteogenic sarcoma but proved after local excision to be merely inflammatory lesions. In one case, several pathologists offered strikingly different opinions ranging from "benign exostotic process" to "fairly malignant sarcoma." Another case cited was diagnosed as myxosarcoma and radical excision was advised. After conservative removal, however, the patient has been well for eight years and the growth has since been reclassified by the Army Institute of Pathology as a soft odontoma. Still another case was described as an undifferentiated sarcoma on frozen section, but conservative excision was elected on clinical grounds. Later paraffin sections established the tumor as a solitary eosinophilic granuloma.

Confusion of this sort occurs partly because oral tumors may be derived from embryonal tissue unique in the jaws: enamel, dentin, cementum, periodontal membrane and pulp. These odontogenic tumors are often similar histologically to tumors of other origin but show different clinical behavior. The myxoma of the jaw arises from the dental papilla. The so-called giant cell tumor probably repre-

sents a foreign body reaction in a predominantly hemorrhagic and fibrous matrix and arises in most instances from the periodontal membrane. It is significant to note that a quarter of a century ago, mandibles were resected for giant cell tumors, then termed giant cell sarcomas.

For such conditions, frozen section is never reliable for diagnosis. A biopsy may easily be obtained from any portion of the mandible or maxilla under procaine conduction anesthesia as an ambulatory procedure; there is no advantage of reserving the biopsy until the patient is under general anesthesia and then pressing the pathologist for his verdict.



FIG. 4. Histopathology of ameloblastoma (*Case 4*). The groups of columnar cells resemble the ameloblasts and stellate reticulum found in the enamel organ. Intercellular edema produces microcysts.

LOCALLY RECURRENT BENIGN TUMORS

The ameloblastoma is the most frequently encountered tumor in this group. It is related to the follicular cyst in that it arises from an earlier stage of ameloblast (fig. 4) and sometimes has a simple cystic appearance. Most often it is multilocular and shows villiform or microcystic projections into the surrounding bone (fig. 11). In rare cases a follicular cyst contains mural thickenings with the characteristics of ameloblastoma, as reported first by Cahn in 1933 (5), by Thoma and Proctor (6) in 1937, and by others.

Because of a tendency to local recurrence, there are advocates of early resection of the jaw for ameloblastoma (7). However, numerous clinical studies have shown that it is a very slowly expanding lesion. We have observed patients who were free from recurrence for twenty years after conservative removal; others, who

despite several recurrences following limited surgery, were still in possession of an intact mandible after thirty years. In the less differentiated variety, there may be an ultimate transition to a more malignant morphology, but it is largely agreed that there is no distant metastasis. Reports in the literature of metastases of ameloblastoma can be attributed rather to misdiagnosis of a true carcinoma or implantation of cells by aspiration, as undoubtedly occurred in a case described as having metastasized to the lung. In this patient inhalation anesthesia was used, the tumor extended into the antrum and pharynx, and there was no lymph node involvement or metastasis elsewhere (8). Also this lesion may have been a carcinoma *de novo*.

Surgical management of the ameloblastoma of small size is a local radical excision in which one-half to one centimeter of bone is removed with the tumor. Preservation of the lower border or some connecting portion of the mandible is of immense importance, since there are many methods of restoring the defect surgically or prosthetically. In larger tumors, where the major thickness of the mandible is involved, the radical choice is to resect the bone so as to encompass the lesion. A more conservative management, however, is being increasingly employed in favorable cases, depending on the extent of surrounding bone, the location of the lesion, the age of the patient, and most important, the histologic grading of the tumor according to the degree of differentiation of the ameloblastic cells. The stellate and ameloblastic forms dictate a relatively conservative management; the acanthoma or epithelioma requires a radical approach. If the former, a local removal is adequate, including surrounding bone where feasible but without excessive curettage, and the patient is observed regularly by roentgenogram. If and when there is recurrence, the tissue is again graded to be sure that it is not degenerating to a more anaplastic morphology, and in many such cases the patient can be carried perfectly safely for the remainder of his life. Resection can always be resorted to as a final means, with no greater disability or risk than if done originally. The psychological advantages of slow adjustment, too, should not be minimized.

Further investigation is needed in order to establish whether zinc chloride, silver nitrate, electrocautery or other means of inducing local necrosis after excision are effective or harmful. Tanner reports twenty cases treated successfully by electrocautery applied to the extent of causing an appreciable sloughing and a sequestrum of the involved bone (9).

ILLUSTRATIVE CASES

Brief reports are made of five cases illustrating the intraoral approach to lesions of the mandible, which generally involve more problems than those of the maxilla.

Case 1. (Adm. No. 571609.) A woman, aged 60 years, was examined in July, 1947. She presented a slight enlargement of the right mandible. Crepitus was elicited on intraoral palpation. The right first and second molars were mobile and showed periodontal bone loss; the second bicuspid was cariously involved. Roentgen examination disclosed a large follicular cyst arising from the unerupted third molar, which was situated at the angle of the mandible (fig. 5).

Management. The enumerated mobile teeth were extracted because of periodontal atrophy, rather than the cystic involvement. A biopsy confirmed the clinical diagnosis, and the cyst was packed lightly for four months through the opening created. The external bulge disappeared and the cyst became reduced in size.

At the end of four months, enucleation was completed and the unerupted tooth removed, under procaine anesthesia, through a 4 by 0.5 cm. aperture. The patient was fully ambulatory on the following day. Packing was continued twice weekly for five months until granulation was complete. Roentgenograms demonstrated a substantial bony regeneration 13 months postoperatively (fig. 6).

Case 2. A surgical resident, aged 27 years, was discovered on routine roentgenographic dental survey (March 1949) to have a cystic area of the right mandible (fig. 7). Owing to a particularly heavy jaw structure, no bulging was evident. The bilocular structure and the absence of an unerupted tooth aroused the suspicion of ameloblastoma.



FIG. 5. *Case 1*, follicular cyst with unerupted third molar

Management. In order to obtain a biopsy, the third molar was removed and fragment of cyst membrane with it. The pathologic examination was inconclusive, showing chiefly keratin. It was therefore decided to remove the upper half of the cyst as an excisional biopsy, but to leave the anterior portion so as not to jeopardize the molar teeth. The histologic picture showed a thickened cyst membrane lined by stratified squamous epithelium (fig. 2).

Healing by granulation was uneventful except for a temperature of 104.5°F. the first postoperative day, causing some concern until an exanthem appeared and proved to be chicken pox. Four months later the second stage was performed, the anterior part having regressed slightly. Final healing with calcification was observed 11 months postoperatively (fig. 8). All teeth remained vital.

Case 3. History and Examination. (Adm. No. 593476.) A woman, aged 69 years, complained of a swelling of the left anterior region of the mandible in March 1949. She had felt neuralgic pain in the jaw for more than a year and gave a history of a previous cyst removal with the extraction of a lower left bicuspid three years earlier. Tingling of the lip was a recent com-



FIG. 6. *Case 1*, 13 months postoperative

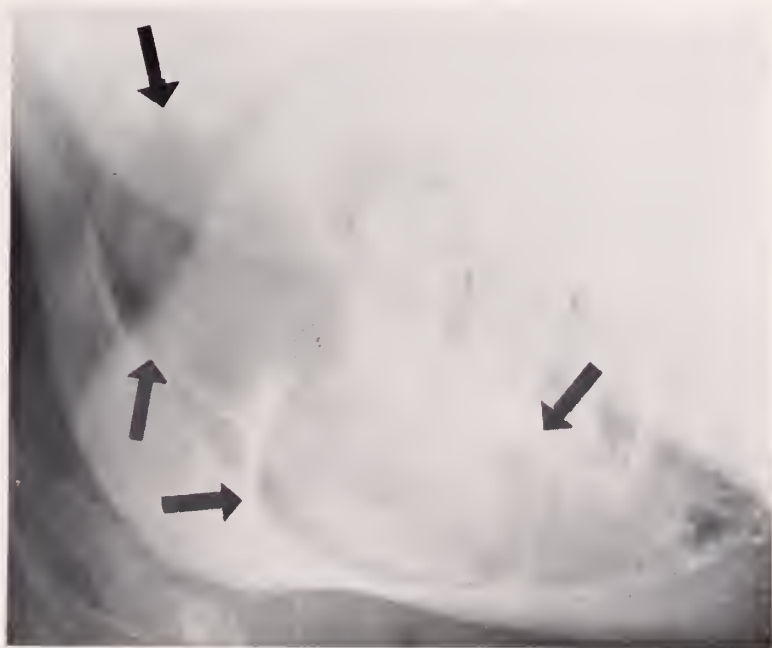


FIG. 7. *Case 2*, simple follicular cyst

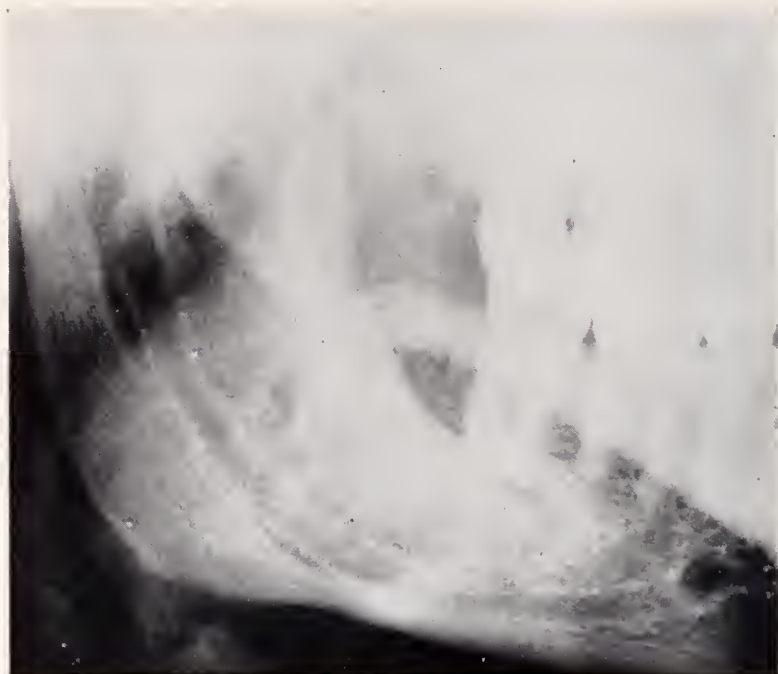


FIG. 8. *Case 2*, 11 months postoperative



FIG. 9. *Case 3*, radicular cyst. Infection has obliterated the cortical capsule

plaint. A semifluctuant, hard swelling was palpated in the submental area and on both aspects of the mandible on the left side. Roentgenographic examination revealed a cystic area with vague outlines (fig. 9), which on aspiration produced a straw-colored fluid indicative of a cyst or cystic ameloblastoma.

Management. A complete enucleation was performed with extraction of the anterior teeth, since the latter presented extreme periodontal recession. Granulation followed in three weeks and, although filling by bone was never complete, the jaw was perfectly restored for functional and cosmetic purposes (fig. 10). The pathologic examination revealed a simple cyst, probably the radicular type. This was undoubtedly a radicular cyst which had been imperfectly excised three years before.

Case 4. History and Examination. (Adm. No. 315007.) A girl, aged 18 years, was first examined on June 4, 1930 for a recurrence of a cyst previously removed in 1927. There appeared an external swelling of the left jaw with a rubbery mass straddling the alveolar



FIG. 10. *Case 3*, 12 months postoperative

ridge, which held a loosely imbedded molar tooth. Crepitus was elicited on pressure. The roentgenograms of the original lesion are no longer obtainable.

First operation. Surgical exploration of the mass in 1930 (Dr. Leo Stern) showed that it extended from the left cuspid tooth to the angle of the mandible. A cystic membrane was present and was excised completely for pathologic examination. The report was ameloblastoma of the cystic type. Rather than intervene further, in view of the patient's youth, the operative site was left for yearly observation. By 1940 no significant change had occurred.

Second operation. In May 1947, the patient was readmitted with swelling and pain. Roentgenograms showed a lobulated cystic area (fig. 11) which was biopsied and proved to be cystic ameloblastoma, well differentiated (fig. 3). Under ether endotracheal anesthesia, the cystic content of the tumor was removed and packed, followed two weeks later by extensive electrocautery in an attempt to cause a slough of the bony capsule containing the peripheral tumor cells. Formalin 4% was applied daily for two weeks more. Following discharge, a large sequestrum separated from the bed of the tumor, and roentgenograms two years later showed a firm non-infiltrative border of mandible (fig. 12).



FIG. 11. *Case 4*, ameloblastoma of mandible 20 years after first occurrence. Multilocular appearance is distinctive.

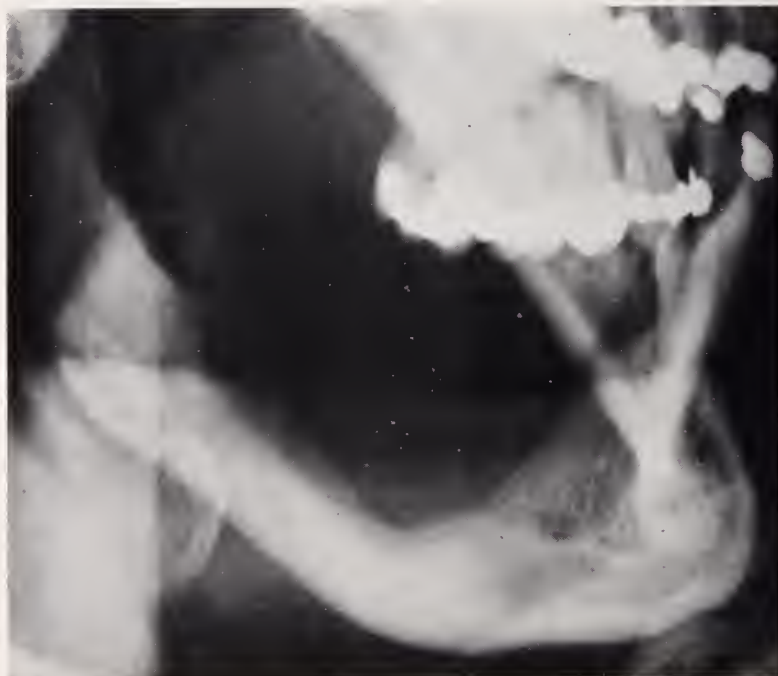


FIG. 12 *Case 4*, 24 months postoperative showing smooth mandibular surface. A sequestrum had been exfoliated three months after operation.

In May, 1950 it became evident that there was some activity of the ameloblastoma in the coronoid region of the mandible, with a clinical bulge and a thin bony cyst seen roentgenographically. Resection of the ascending ramus was finally advised, and recent information

has indicated a successful removal of the active tumor. The horizontal ramus was retained together with full facial contour. A complete cure is suggested by the lack of pathologic infiltration in the line of resection of bone.

Case 5. History and Examination. (Adm. No. 588441.) A Puerto Rican boy, aged 11 years, was admitted in September, 1948 for a growth in the right mandible of six months reported duration. A hard, non-movable mass was palpated on the right aspect of the mandible between the cuspid and first molar region. The anterior teeth were inclined toward the mass. Roentgenograms showed displacement of the roots without resorption by a finely lobulated area extending across the symphysis (fig. 13). A biopsy was obtained and showed fragments of "cellular myxofibroma with considerable atypism and destruction of bone" (fig. 14).



FIG. 13. *Case 5*, central myxoma of mandible. Insert is occlusal film, showing displacement of the teeth without destruction of the roots.

The Oral Pathologist, Dr. Lester R. Cahn, was of the opinion that the cells were not anaplastic or malignant and that the occurrence of such tissue did not represent a primitive structure but arose from the dental papilla, a normal mesenchymal tissue in a growing jaw. The tumor may well have arisen from one of the three imbedded teeth.

After suggestions of mandibular resection and following another biopsy, Dr. Klemperer was consulted. He gave the following opinion:

- 1) There was no bony infiltration, although a fibrous capsule was absent.
- 2) The tumor cells were quite benign.
- 3) In view of the patient's age and successful treatment of other such tumors without recurrence (10), a conservative removal was indicated.

The cautious approach elected was strengthened by a marked depression on the patient's

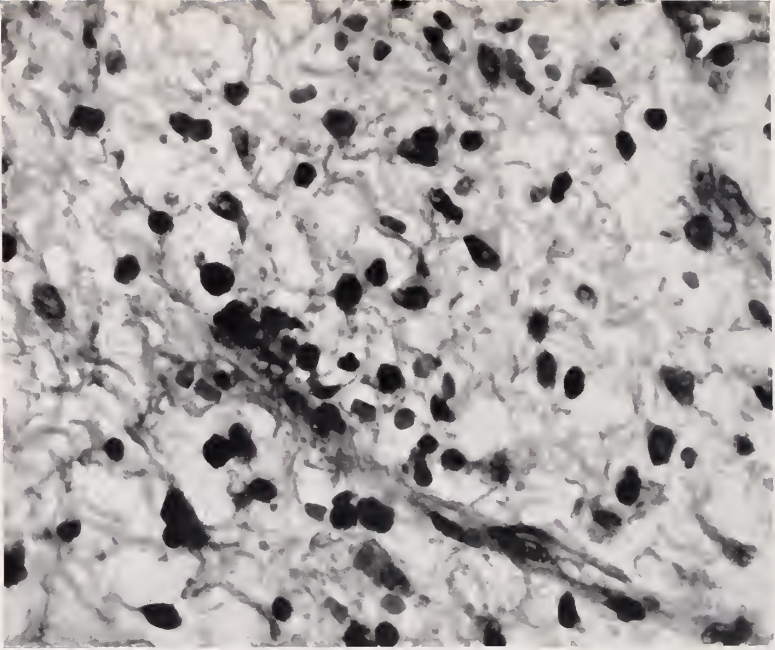


FIG. 14. *Case 5*, histopathology shows embryonal type of connective tissue resembling that of the dental papilla.



FIG. 15. *Case 5*, 4 months postoperative

part, with an attempt at suicide by jumping from a window. Psychiatric guidance was necessary, with a gradual but definite improvement in the patient's outlook.

Operation. After construction of an orthodontic appliance to prevent postoperative fracture, the tumor was explored and dissected under cyclopropane-ether endotracheal anesthesia. Strong prying with a curette was necessary to remove adherent, cartilage-like portions of the mass posteriorly, with the anterior part more gelatinous and easily separable. All involved teeth were removed. Phenol was applied and neutralized. Oxyeel and gauze with large stay sutures were used for packing.

Course. Zinc chloride 10% was applied to the base of the cavity for five minutes every two days for two weeks postoperatively. Healing was excellent within another month. Recent roentgenograms showed advanced filling and calcification (fig. 15).

In June, 1950, a superficial recurrence was observed and the mass removed for examination. Precisely the same histopathologic picture appeared as originally. If this area shows renewed growth in the future, it is possible but not certain that another conservative removal will be attempted, coupled with electrocautery. The question of final cure cannot be predicted at this time.

SUMMARY AND CONCLUSIONS

Simple enucleation or marsupialization, or a combination of both methods, is by far the most satisfactory procedure in cysts of the jaws, as illustrated by the first three cases. There is little rationale for sacrificing sound bone, and only occasionally do vital teeth have to be removed. The surgeon is remiss if he does not carefully and repeatedly evaluate the vitality of all teeth and exert every means to maintain their life.

Benign and localized tumors are successfully treated by techniques which parallel those found effective in the treatment of cysts. Resection of the mandible is not justified except for malignant lesions. Unfortunately resection is sometimes selected because of the surgeon's greater familiarity with radical methods than with conservative intraoral surgery. This has also created a definite superficiality in diagnosis of benign lesions of the jaws, such as reliance on frozen section or incomplete roentgenographic studies, simply from an attitude that the eventual therapy must be the same with any sizable lesion. The cure of countless encapsulated tumors, with no recurrence and with perfect restoration of anatomy and function, attests otherwise.

A basis of judgment is also provided in locally recurrent tumors such as ameloblastoma. In small lesions a dissection of surrounding bone of a local radical nature is the treatment of choice. Debate centers, however, on the more extensive lesions: whether to resect immediately or whether to perform local removals as the indication arises. Case 4 is presented as evidence that the mandible may be preserved for at least 20 years (and often for a lifetime) without resection in favorable cases. Where the recurrence is rapid and extensive, radical excision may be resorted to with the original chances of success. Case 5 is an experiment in conservatism with a different tumor and represents an earlier recurrence than Case 4, with somewhat greater uncertainty as to preserving the jaw. Cases 4 and 5 both present a method of artificial necrosis, whether by electrocautery or chemical means, which may ultimately bring a refinement of methods and an increased chance of initial cure. No conclusions are as yet warranted.

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EFFECTS OF DIHYDROERGOCORNINE ON THE CARDIOVASCULAR SYSTEM IN MAN: BLOOD PRESSURE, HEART RATE, AND RESTING ELECTROCARDIOGRAM*

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We are investigating in man the action of dihydroergocornine (DHO-180)†, a newer dihydrogenated ergot alkaloid derived from ergotoxine. We studied first the action of this drug on blood pressure, heart rate, and the electrocardiogram in patients with functional and organic heart disease in order to evaluate the possible influence of such action on our later observations.

METHOD AND RESULTS

Intravenous injections of dihydroergocornine were given to 116 patients. Normal controls as well as cases of functional cardiac disturbance and organic heart disease were included in the series. Single intravenous injections of DHO-180 were given in all instances; in 7 of the patients the dosage was repeated on a subsequent day. For 116 of the injections, the dosage of DHO-180 was 0.5 mg; for the remaining 7 it varied between 0.25 and 1.0 mg. Electrocardiogram, blood pressure, and heart rate were recorded before administration of the drug, and at 15 minute intervals for 30 to 60 minutes following the injections. The changes occurred within a few minutes following the intravenous injection, and lasted over one hour.

The response to the drug showed individual variation. The range of maximal change in both systolic and diastolic levels of blood pressure are given in Table 1. The cases were subdivided into normotensive (below 150 mm Hg. systolic and below 90 mm Hg. diastolic) and hypertensive (150 mm (and over) Hg. systolic and/or 90 mm Hg. and over diastolic) groups on the basis of resting blood pressure before injection of the drug. Following injection of DHO-180, there was no significant change in systolic blood pressure in one-half the normotensive subjects, a slight to moderate systolic decrease occurred in over two-fifths, and a slight and clinically insignificant systolic rise was noted in 7 of these patients. The hypertensive subjects showed a more uniform and greater decrease of systolic levels in three-fourths of the instances, and in only 2 instances did a slight rise occur. In the normotensive subjects the diastolic blood pressure levels did not change remarkably. Sixty per cent of the hypertensive subjects had no significant change in diastolic levels, and 40 per cent had a slight to moderate diastolic drop following administration of the drug.

The heart rate was recorded following 123 injections of DHO-180 in 116 cases (table 2). In 110 instances there was a decrease in the heart rate, and in 63 of these the decrease was considered to be significant (11 to 30 beats a min-

* From the Cardiographic Department, The Mount Sinai Hospital, New York City. This article is not part of the symposium.

† The dihydroergocornine used in this study was kindly supplied by Dr. C. Henze of the Sandoz Company, New York.

ute). The average maximal decrease in rate for the 110 cases was 12.7 beats a minute. Following 13 of the injections the heart rate increased slightly; in only one instance was the increase unusually marked. In most instances regular sinus rhythm was present in the control record. Auricular fibrillation, present in the control of several cases, was not abolished by the drug. No arrhythmia was

TABLE 1
*Effect of dihydroergocornine on blood pressure**

	-10 TO +10	-11 TO -20	-21 TO -30	-31 TO -40	-41 TO -50	-51 TO -60	+11 TO +20	TOTAL
Systolic Blood Pressure: Range of Maximal Change in mm Hg.								
Normotensive cases (below 150 mm Hg).....	45	31	7	0	0	0	7	90
Hypertensive cases (150 mm Hg and over).....	6	5	7	9	2	2	2	33
Totals.....	51	36	14	9	2	2	9	123
Diastolic Blood Pressure: Range of Maximal Change in mm Hg.								
Normotensive cases (below 90 mm Hg).....	87	1	1	0	0	0	4	93
Hypertensive cases (90 mm Hg and over).....	18	9	3	0	0	0	0	30
Totals.....	105	10	4	0	0	0	4	123

* The totals represent 123 injections of Dihydroergocornine intravenously in a total of 116 patients (7 received second injection on a subsequent day).

TABLE 2
*Effect of dihydroergocornine on heart rate**
Range of Maximal Change in Heart Rate (beats per min.)

	DECREASE				INCREASE				GRAND TOTAL
	0 to -10	-11 to -20	-21 to -30	Total	0 to +10	+11 to +20	+41 to +50	Total	
No. of Cases.....	47	51	12	110	10	2	1	13	123

* The totals represent 123 injections of Dihydroergocornine intravenously in a total of 116 patients (7 received second injection on a subsequent day).

produced except for sinus bradycardia in some cases. Where premature beats were present in the control, the drug did not abolish or increase their occurrence.

Administration of DHO-180 had no effect on the electrocardiogram in one-half of the cases; in most of the remaining half, minimal electrocardiographic changes were noted. These consisted of heightening of the T waves and, more rarely, slight RS-T elevations, but the variations were so small that the inter-

pretation of the electrocardiogram remained unaltered. In the few cases of neurocirculatory asthenia or of anxiety state that exhibited abnormal control resting electrocardiograms, the tracing reverted to within normal limits following injection of DHO-180. This is illustrated in Figure 1 which refers to a 17 year old female (R.M.) with severe anxiety state and cardiac neurosis. Control electrocardiogram was distinctly abnormal with RS-T depression and diphasic T waves in leads II and V₄; these abnormalities persisted after a period of rest

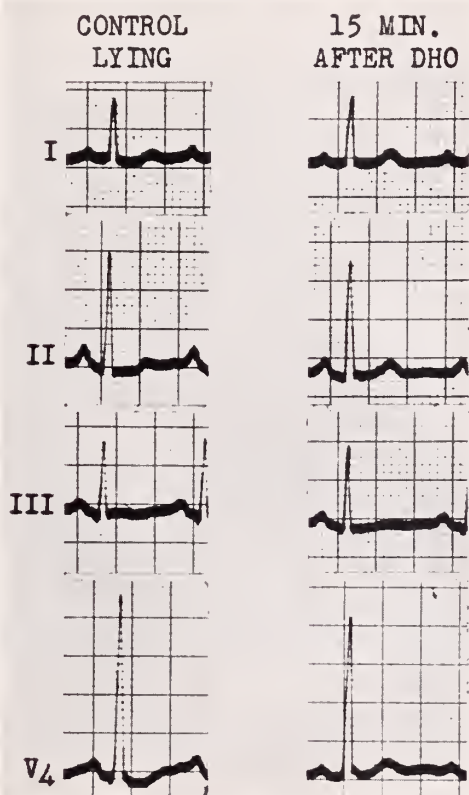


FIG. 1. R. M., 17 years. Anxiety State; Cardiac Neurosis. Control resting electrocardiogram is abnormal: RS-T depressed and T waves diphasic in leads II and V₄. 15 minutes after DHO-180 (dihydroergocornine) intravenously, the electrocardiogram is within normal limits.

and were similar to tracings taken on other occasions. Several minutes after intravenous administration of DHO-180, the record reverted toward normal and a tracing taken 15 minutes after the injection was within normal limits. On the other hand, 30 patients with unequivocal evidence of organic heart disease and abnormal control resting electrocardiograms, showed no significant electrocardiographic changes following the drug. Figure 2 demonstrates the findings in one such case (C.D.), a woman aged 50 years, suffering from hypertensive heart disease. The control electrocardiogram was abnormal with RS-T depression in

leads I, II, and V_4 and diphasic or semi-inverted T waves in all four leads. There was no change noted in subsequent tracings taken at 15 minute intervals for one hour after the intravenous injection of 0.5 mg of DHO-180.

It is not without significance that most of the cases which exhibited a decrease in blood pressure following injection of DHO-180 did not show a concomitant rise in heart rate; there was either no significant change or more commonly a definite decrease in rate. These effects have been considered to be due to "sympathicolytic" action of DHO-180; however, the exact site and mode of action of the drug remain unknown, and may be related to "central depression of vasomotor reflex pathways and central vagal stimulation" (1).

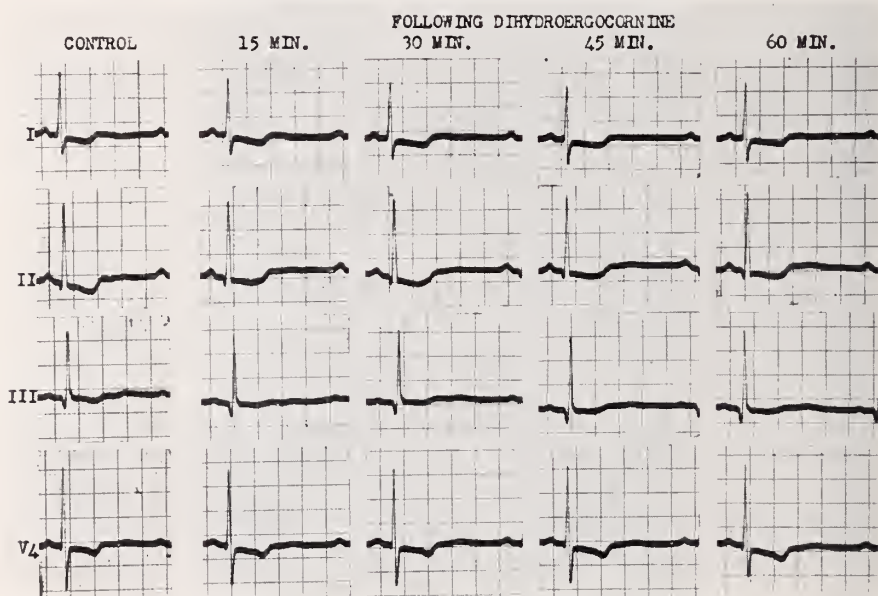


FIG. 2. C. D., f., 50 years. Hypertensive Heart Disease. Control ECG is abnormal: RS-T depression in leads I, II, and V_4 ; T wave diphasic or semi-inverted in all four leads. No change in electrocardiographic tracings taken for one hour after intravenous injection of 0.5 mg DHO-180 (dihydroergocornine).

SIDE REACTIONS

The most frequent side reaction of intravenous dihydroergocornine was mild to moderate stuffiness of the nose, which occurred in over one-half of the 123 injections. This is considered to be the result of "sympathicolytic" vasodilator action of the drug on the arterial vessels supplying the area. Nausea occurred in slightly over one-fourth of the patients with mild to moderate dizziness, especially on standing, in less than one-fourth of the cases. Postural hypotension on standing was noted in about 15 per cent of the cases. In 3 instances the patients fainted on standing but recovered immediately when placed in a recumbent position. Less frequent side reactions included dryness of the mouth in 14 subjects, moderate weakness in 13, and vomiting in 9. Rare effects were generalized

feeling of warmth, dull headache, cold perspiration, belching, and tingling of the fingers. Side reactions to the drug did not appear in 19 per cent of the cases.

Although the series included 81 cases of angina pectoris (either typical or atypical), anginal seizure attributable to the drug did not occur in a single instance. Two patients with organic heart disease and anginal syndrome did complain of precordial pain following the injection. In one case, the pain which occurred 5 minutes following injection of the drug, was relieved quickly by sublingual nitroglycerine and was not attended by any change in the electrocardiogram. In the second instance, the pain occurred 10 minutes following the DHO-180 with associated changes in the electrocardiogram. Relief was obtained without nitroglycerine in 5 minutes. Since this latter patient suffered from almost complete status anginosus, the occurrence of angina following injection of DHO-180 was considered fortuitous. In neither case was there further chest pain during the ensuing hour when the full action of the drug was in effect. It may be concluded, then, that in the dosage employed DHO-180 may be safely given to patients with angina pectoris. This drug has therefore replaced ergotamine tartrate in our studies of the distinction of functional and organic heart disease (2,3).

Our observations on the effect of the drug on blood pressure and heart rate are similar to those reported by other workers (4-8).

SUMMARY

The effect of a single intravenous injection of dihydroergocornine (DHO-180) on the blood pressure, heart rate and resting electrocardiogram was observed in 116 cases. In normotensive subjects the systolic blood pressure showed no significant alteration in half of the cases, and a slight to moderate drop in about two-fifths; the diastolic levels showed practically no significant change. In the hypertensives the systolic levels were decreased in three-fourths of the cases; changes in diastolic levels occurred in slightly less than half. The cardiac rate decreased in nearly all.

The resting electrocardiogram was not significantly altered in almost all the patients studied. However, in cases of anxiety state with abnormal resting electrocardiogram, the tracing was normalized following DHO-180.

The side reactions to intravenous injection of dihydroergocornine were stuffy nose, nausea, and, less frequently, dizziness and postural hypotension, all of which were transient. The safety of this drug for clinical investigation in patients with organic heart disease was confirmed.

We wish to extend our thanks to Miss Nita Bookstaver and Mrs. Ruth S. Bindell for their technical assistance.

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INTUSSUSCEPTION OF THE APPENDIX*

REPORT OF A CASE AND REVIEW OF THE LITERATURE

HERMAN D. ZEIFER, M.D.

Intussusception of the appendix is an uncommon occurrence, and until such time as our clinical acumen will lead to a correct preoperative diagnosis, individual case reports will be of value.

The first case of intussusception of the appendix to be reported was that of McKidd (5). The patient was a boy, aged 7 years, who for two months before his death suffered from the most excruciating abdominal colic and required almost constant chloroform anesthesia. The tremendous strides in surgery and medicine in subsequent years have introduced more successful therapeutic intervention, but preoperative diagnosis has lagged far behind.

The case herein presented is of added interest since the intussuscepted appendix contained a mucocele and although we established the diagnosis of ileocolic intussusception, we failed to consider the appendix as the offending organ.

CASE REPORT

History. Mrs. R. M., (Adm. No. 612289), aged 42 years, entered the Surgical Service of the Mount Sinai Hospital on May 16, 1950, with the chief complaint of periumbilical and lower abdominal pain. She had been well until nine days prior to admission. Then, following a week-end of indiscriminate dietary indulgence, she suddenly began to experience periumbilical and diffuse lower abdominal cramping pain, occurring intermittently every 20 minutes, and lasting 5 minutes. There was no radiation to the back, shoulder or groin, and she felt fairly well between attacks. This pain pattern continued with relatively little variation in severity up to the day of admission. A loose stool occurring shortly following the onset of the illness contained a trace of bright red blood. An enema administered 5 days prior to admission was productive of a small quantity of brown liquid feces. Four loose bloodless stools accompanied by small quantities of flatus were subsequently passed prior to admission. Vomiting began 5 days before admission and followed each attempt to ingest food. There were no chills or fever.

The past history and system review were negative.

Examination: The patient was a pale, well developed woman, not appearing ill. Her pulse was 96, respirations 20, and rectal temperature 99.6°F. Her tongue and skin were dry. Her abdominal wall was free of scars and there was no distention. A sense of resistance was felt over the entire right side of the abdomen most marked in the lateral umbilical area. No palpable mass was present and the liver and spleen could not be felt. There was no spasm or tenderness. Pelvic and rectal examinations were negative.

X-ray Examination: Flat plate of the abdomen demonstrated a single, non-dilated, air-containing loop of small intestine in the left upper quadrant without a fluid level. No other findings were noted.

Laboratory data: The hemoglobin was 11.9 gm.; the white blood cells were 9,050, with 48 per cent segmented and 29 per cent non-segmented polymorphonuclears; 11 per cent lymphocytes; 9 per cent monocytes; 2 per cent eosinophiles; and 1 per cent basophiles. The erythrocyte sedimentation rate was 25 mm. per hour. The stool showed a faint trace of occult blood. The blood urea nitrogen was 11 mg. per cent. The urine contained a faint trace of albumin, 1 plus sugar and 3 plus acetone.

* From the Surgical Service of Dr. John H. Garlock.

Course. A diagnosis was made of incomplete small intestinal obstruction with dehydration. Appropriate intravenous fluid therapy was instituted and a long intestinal tube (Cantor) was passed and suction started. The temperature, pulse and white blood cell count remained normal, and the abdominal pain ceased. Flatus was passed on the third hospital day. On the fourth day the intestinal tube was clamped, only to be followed by recurrence of the pain. Suction was resumed and the pains disappeared. On the eighth day, a flat plate of the abdomen revealed that the intestinal tube was well into the small bowel and that the previously demonstrated air-containing loop of small intestine was no longer visible. The patient's appetite returned, flatus and stool were passed, and she remained afebrile. The intestinal tube was then removed, and since the patient continued well, she was discharged 2 days later to be studied further in another city where she resided. The etiologic diagnosis remained obscure, but it was hoped that barium studies of the gastrointestinal tract would eventually clarify the problem.

Three days following discharge from the hospital, the pains returned accompanied by anorexia and vomiting and 2 to 3 loose, non-bloody stools a day. She was readmitted on

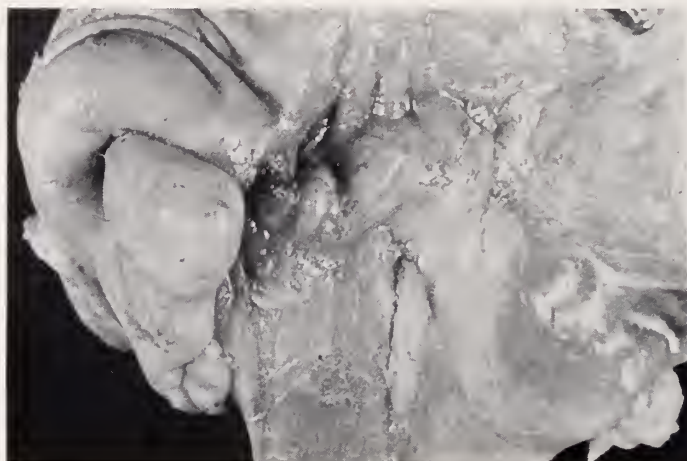


FIG. 1. Photograph displaying the serosal aspect of the gross specimen. The appendix is partly invaginated into the cecum. The bulbous tip of the mucocoele is clearly seen. The terminal ileum is seen joining the cecum from below.

June 3, 1950. Examination including laboratory studies were essentially similar to those of the previous admission except that the urinalysis on this occasion revealed no deviation from the normal.

A flat plate of the abdomen again revealed a single loop of small bowel in the left upper quadrant moderately distended by gas and fluid. Barium enema demonstrated the presence of a large sausage-shaped mass filling the right side of the colon. The apex of this mass was seen to be in the mid-transverse colon. As the enema proceeded, the apex of the mass receded into the ascending colon but after evacuation it was noted again in the distal transverse colon. The colonic haustra were visualized around this mass. The appearance was that of an ileocolic intussusception. Whether a tumor mass was present at the apex of the intussusception could not be determined from this examination.

A long intestinal tube was passed without difficulty into the small bowel. Following the barium enema, the patient was prepared for operation with blood transfusions and parenteral fluids.

Operation. Under ether-cyclopropane anesthesia, laparotomy was performed through a right rectus incision (Dr. John H. Garlock). The terminal 1 foot of ileum presented a

shaggy peritoneal surface. The appendix was found thickened and enlarged and its base had intussuscepted into the cecum. The intussusception of the appendix, cecum and ileum into the ascending colon and transverse colon had apparently reduced spontaneously following the barium enema, and only the appendix and a portion of cecum now remained partly intussuscepted. The base of the appendix felt markedly thickened and it was difficult to tell whether a tumor was located at this point without opening the bowel. Attempts to reduce the intussusception were not successful. It was felt that under these circumstances resection would be the safest procedure. Accordingly, ileocolic resection with isoperistaltic side to side anastomosis was performed.

Surgical specimen: The specimen consisted of a segment of cecum and ascending colon 23 cm. in length, together with an attached segment of terminal ileum measuring 11 cm. Projecting 3 cm. into the cecal lumen was an intussuscepted segment of bowel which consisted of the base of the appendix and a portion of the surrounding cecal wall. Several mucosal ulcerations were present on the intussusceptum at the apex of which was an opening 6 mm. in diameter, which could be probed to a depth of 5 cm. The appendix was enlarged to three times normal size. On the serosal surface many thin fibrous and fibrinous

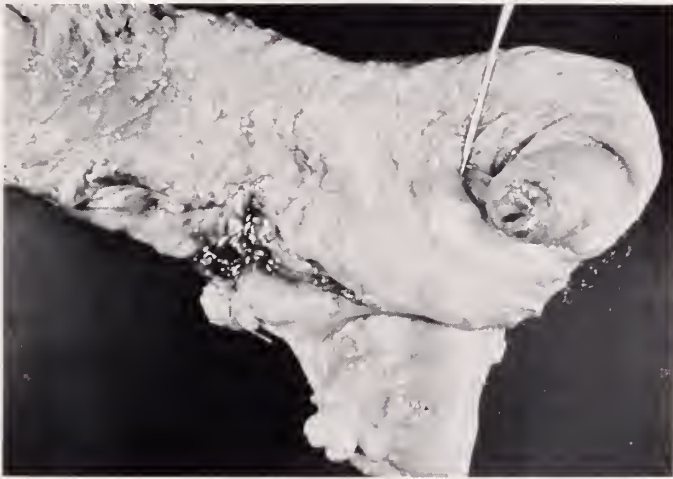


FIG. 2. Photograph displaying the intussuscepted base of the appendix. The probe passes through the normal ileocecal valve into the terminal ileum which is seen entering the cecum from above.

adhesions were attached to the cecum and ileum. The serosal aspect of the ileum was markedly injected. Upon sectioning the specimen, the base of the appendix was seen to be ballooned out to a diameter of 1.5 cm. Distal to this, the lumen was obliterated for a distance of 2 cm., and then flared out at the bulbous tip to form a cavity containing a grey mucoid substance. The entire wall of the appendix was thickened. No tumor was present. On the basis of these findings, the mechanism of the intussusception was postulated as follows: A fecolith had probably occupied the hollowed-out base of the appendix and the peristaltic contractions set up by the appendix to eject the fecolith had initiated the intussusception. The obliterated portion of the appendiceal lumen was secondary to the chronic intussusception and was probably responsible for the development of the mucocoele distally. Since a fecolith was not found, one might be tempted to incriminate the mucocoele as the starting point of the intussusception. It was difficult for us, however, to see how a mucocoele at the most distal portion of the appendix would have initiated intussusception at the base. The accompanying photographs demonstrate the specimen quite well.

Post-operative course. The patient's course following operation was uneventful and she

was discharged from the hospital on the 8th post-operative day entirely free of the previously distressing abdominal pain.

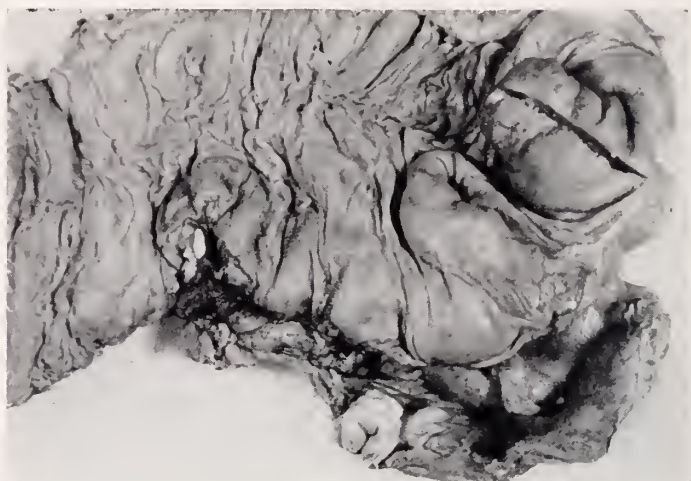


FIG. 3. Photograph demonstrating the sectioned appendix. The ballooning-out of the base can be seen through the longitudinal incision.

DISCUSSION

Since the first report of this condition was made by McKidd (5) in 1858, less than 100 cases have been recorded in the literature. In 1941, McSwain (6) conducted a thorough analysis of 77 cases and found the average age of the patients to be about 16 years. He pointed out that the time lag between onset of symptoms and operation ranged from 2 hours to 9 years.

Szenes (7) described three types of intussusception of the appendix: 1. invagination of the appendix into itself, 2. partial or complete invagination of the appendix into the cecum, and 3. compound intussusception wherein the intussuscepted appendix progresses distally into the colon including the ileum. Of the total of 82 cases reviewed by Fraser (2), the first type was present in 2 cases, the second in 44 cases, and the third in 32 cases. The remaining 4 cases were intussusception of inverted appendiceal stumps. Frazer (2) maintained that were it not for the third group, intussusception of the appendix would be relegated to the limbo of benign surgical curiosities. It is the tendency to lead to a compound intussusception that militates for early accurate diagnosis. The mortality rate found by McSwain (6) for intussusception of the appendix of the compound type was 14.8 per cent, while that of simple intussusception of the appendix was only 2.6 per cent. In the compound type the intussusception of the appendix will be masked and will not be apparent until either the compound intussusception is reduced at operation (as in the case reported here), or it will only be discovered postoperatively when the resected specimen is examined. The extent to which the intussusception has progressed will depend on the length of time it has been allowed to persist but it must be remembered that diagnostic barium

enema can cause considerable reduction. The apex may be found anywhere in the colon. One extreme variant was encountered by Burghard (1) when he operated on a man of 60 for what he thought was a prolapsed polyp at the anus. After removing the specimen he found that it was a completely inverted appendix, the apex of a gross intussusception. Incidentally, the appendix was found to have a small papillomatous tumor at its base.

In regard to those cases with mucocele of the appendix, it is characteristic that the appendix in this condition is usually large. As a rule, there is no communication between the appendiceal lumen and the cecum. Marked muscular hypertrophy of the appendix is a feature, and when it is opened it is found to be filled with translucent yellowish gelatinous material. In the case reported here, the mucocele was secondary to obliteration of the appendiceal lumen. It was probably not the initiating factor in the intussusception.

Etiology: Many theories have been presented to explain the development of intussusception of the appendix. Wakely (8) suggested that hyperactive peristalsis provoked by worms or fecaliths may be responsible in some cases. He suggested too that the increased lymphoid tissue in the terminal ileum and appendix in young children acts as a foreign body and gives rise to increased and irregular peristalsis of bowel and appendix which sometimes culminates in intussusception. McDermot (4) conducted anatomical studies of the base of the appendix and found there a muscular sphincter. He thought that spasm of this sphincter would give rise to a hard mass at the base of the appendix, which would act as the apex of an intussusception. Fraser (2) found the cause of intussusception in four cases to be an inversion of the appendiceal stump in patients in whom the appendix had been removed. McSwain (6) likewise noted this possibility and brought up for consideration the advisability of invaginating the stump of the appendix after an appendectomy.

Symptomatology: McSwain (6) summarized the salient clinical manifestations of intussusception of the appendix. The pain was generally intermittent, cramp-like, and paroxysmal, with complete relief at intervals. Nausea and vomiting almost universally accompanied the pain. Of 77 cases, seventeen had blood in the stools. In the majority of the cases the bowels moved normally. There was only slight fever, increase in pulse rate or leukocyte count except in patients in whom necrosis, gangrene, or peritonitis occurred. Distention occurred infrequently and a palpable mass was noted in 43 patients. The tumor varied in size from a small, round, barely palpable one to a large sausage-shaped mass extending across the abdomen. The tumor increased and decreased in size under observation. There was little muscle spasm and tenderness was not extreme.

The differentiation of acute appendicitis from intussusception of the appendix unaccompanied by ileocolic intussusception is quite difficult. McSwain (6) suggests the following points to aid in the differential diagnosis: 1. The history of more attacks than are usually seen in acute appendicitis; 2. The more definitely cramp-like pains, similar to those of early intestinal obstruction; 3. The history of blood or mucus or both in the stools or their discovery on examination; 4. The history of palpation of a mass in the right lower quadrant; 5. Less fever,

increase in pulse rate, and leukocytosis than would be expected in an individual with an appendix inflamed enough to cause a clinical picture of equal severity.

Surgical Treatment. The simplest method of treatment is to reduce the intussusception and remove the appendix. Should the intussusception be irreducible one could incise the cecum and remove the appendix from within (Hinson (3)). In compound intussusceptions, the cecum may be anchored to the lateral abdominal wall after reduction. In the case reported here, a cecal neoplasm could not be ruled out and so an ileocolic resection with side to side anastomosis was performed.

SUMMARY

A case of compound intussusception of the appendix associated with a mucocoele in a 42 year old woman is reported, and the relevant literature reviewed.

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THE COINCIDENCE OF TRAUMA IN THE PRESENCE OF A WILMS TUMOR

M. SWICK, M.D.*¹

One third of all cases of Wilms tumor presents a history of trauma (Campbell). Yet, careful analysis reveals that trauma merely calls attention to the presence of the tumor and is not the causative factor. The case herein reported illustrates this point.

Wilms tumors are the most common type of growth involving the urinary tract or other abdominal organs in children. Only tumors of the eye and orbit occur with greater frequency in this age group.

The vast majority of embryomata of the kidney is large, although a few small ones have been reported, the latter either by urologic investigation or operation, or at autopsy; they usually grow rapidly and to huge proportions. It is not uncommon for them to produce extra-urinary complaints as a result of their encroachment upon adjacent viscera—intestines, liver, spleen, diaphragm, large vessels of the abdomen, and pancreas. According to Campbell, less than half of the cases show metastases when first seen. The tumor most commonly spreads by vein to the liver, spleen, spine, intestines, diaphragm and lung, less commonly through the lymphatics or by direct extension. The liver and lungs are the sites most usually involved by metastases. Microscopically, the growths are of mesodermal origin leading to such terms as sarcoma, adenosarcoma, rhabdosarcoma, sarcomatocarcinoma and teratoma, depending upon the predominance of a particular type of cellular structure. Tissue such as striped and unstriped muscle, elastic fibres, cartilage, bone, adipose tissue, and mucoid stroma may be found; in addition, tubules of high cylindrical epithelium or cuboidal cells with indistinct lumina surrounded by spindle cells are observed.

The long range prognosis is bad. Gross recently stated that the cases living 2 years after operation are more apt to have a 5 year or more survival period. The only cures have followed operation plus radiation therapy; some observers prefer pre- and post-operative radiation, others only post-operative therapy. The immediate post-operative mortality until recently high, has been greatly reduced because of early diagnosis and immediate operation, the trans-peritoneal approach, the use of transfusions, antibiotics, and the maintenance of electrolyte balance, as reported by Gross.

CASE REPORT

History. J. B., M.S.H., #585206. A 2½ year old, white female child was apparently well until the afternoon of admission to the hospital, when the mother noted blood clots on the floor which she mistook for "plums". While in the Reception Ward, a 6 inch, fresh blood clot was removed from the vagina. That night the child passed pink urine containing

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¹ Presented at monthly Urological Conference of Dr. Gordon D. Oppenheimer, December 27, 1949.

blood clots. Questioning of the parents disclosed a history of a "hit" by a bare-footed younger brother to the side of the abdomen contra-lateral to the lesion to be described. Except for diphtheria, whooping cough, measles, chicken pox, and a head injury 2 months

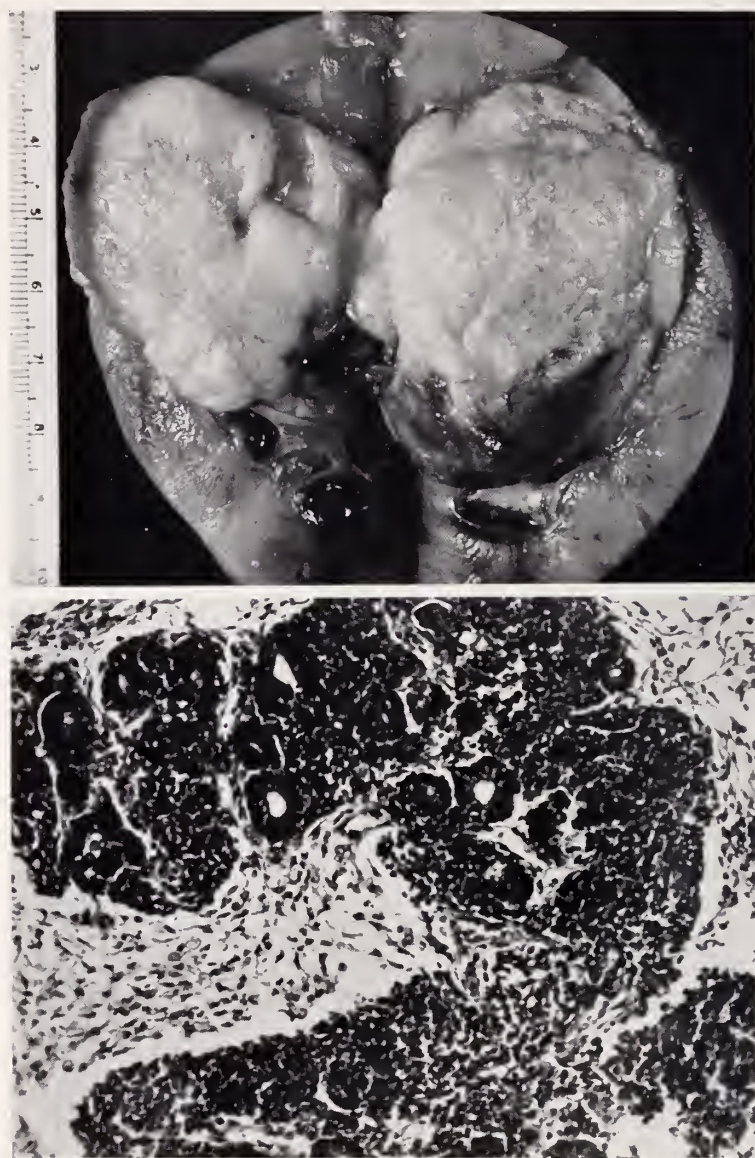


FIG. 1. (Upper) Photograph of sectioned kidney, demonstrating almost completely encapsulated Wilms tumor.

FIG. 2. (Lower) Photo micrograph revealing carcino-sarcomatous nature of the tumor

ago followed by a nose bleed, the past history was entirely negative. The family history was irrelevant.

Examination. There was a smooth, firm, ballotable mass in the region of the left kidney; no other abnormalities were noted.

Laboratory findings: Clotting time—8 minutes; Bleeding time—1 minute, 40 seconds; Hemoglobin—varied between $10\frac{1}{2}$ and 13.3 grams; (the blood count was otherwise normal except for pre-operative leukocytosis). Blood Wasserman—negative; pre-operative urine—red blood cells; post-operative urine—negative.

Intravenous urography revealed an enlarged left kidney outline with no excretion of dye on that side; the right kidney and its upper urinary tract as well as the bladder outline were normal. X-ray of the chest, skull, lungs, and bones showed no evidence of a metastatic lesion.

Operation. On September 7th, 1948, (6 days after admission), under general ethylchloride ether anesthesia, a left lumbar exploration was performed for possible tumor of the kidney. The kidney was large, soft, smooth and about twice the normal size. No dilated surface blood vessels were encountered. Neither the consistency nor the surface appearance of the kidney was suggestive of tumor. Accordingly, a tourniquet was placed about the pedicle and the kidney aspirated; no fluid was obtained. It was reasoned therefore that despite the smooth, soft appearance of the kidney, that one was dealing most likely with tumor. (Incidentally, I do not believe that aspiration of malignant growths of the kidney, preferably performed with a tourniquet applied to the pedicle at the time of operation, carries a risk from the standpoint of spread. Ferguson has not found any serious complications resulting from aspiration of malignancies of the kidney). A nephrectomy was then performed in the typical fashion.

Pathology report. Specimen is a child's kidney weighing 160 grams and measuring 9.5 x 6 x 5.5 cm. It was removed with the true capsule and previously sectioned, revealing a soft, bulky, tumor apparently arising in the region of the central calyces in the retropelvic region. At one point it extends almost to the capsule. The tumor measures 4 cm. in diameter and springs forth from the distended kidney revealing a compressed hemorrhagic pelvis. The tumor is made up of glistening yellow-white tissue arranged in tiny globules. It is slightly sticky and the central areas are marked by a yellow-red necrotic process. Clear invasion of the pelvis is not demonstrable despite hemorrhagic suffusion in the pelvis near the tumor. The ureter is free. The large vessels are short and well preserved. Report—Wilms tumor (figs 1, 2).

Post-operative course. There was moderate distention and temperature elevation to 103°F for one day. The wound healed satisfactorily and the child was discharged from the Hospital on the 19th post-operative day. Radiotherapy was instituted on the 14th post-operative day and was continued in the Out-Patient-Department.

Follow-up notes. The wound healed well. The child looked well, having gained weight. Chest x-ray, June 18th, 1949 was negative. When last seen, April 17th, 1950, the child was well, growing normally, gaining weight, and free of metastases.

SUMMARY

A case of a Wilms tumor in a child, aged $2\frac{1}{2}$ years, is presented. Attention to this condition in this patient was first called by the appearance of hematuria with a coincidental history of mild trauma to the contra-lateral side of the abdomen. A large, non-functioning left kidney was revealed by intravenous urography performed because of the presence of hematuria and the finding of an enlarged left kidney. Operation demonstrated a smooth, soft, symmetrically enlarged left kidney which on aspiration yielded no fluid, and hence a diagnosis of tumor was entertained. Nephrectomy was followed by a smooth, post-operative and follow-up course.

AN ELECTRIC FILTER FOR ESOPHAGEAL ELECTROCARDIOGRAPHY FOR THE ATTENUATION OF EXTRANEOUS LOW FREQUENCY POTENTIAL¹

A. GRISHMAN, M.D., AND M. H. PALEVIN, E.E.

Esophageal electrocardiography can yield valuable data in the analysis of complicated arrhythmias and in the study of the posterior and diaphragmatic ventricular potentials. Extraneous potentials arising from the gastric and esophageal wall or caused by respiration often interfere and distort the esophageal electrocardiogram so that it is difficult to obtain acceptable records consistently. The frequency range of the interfering potentials is, in most instances, below one cycle/per sec. If considerable attenuation of frequencies below one cycle/per sec. could be obtained with little if any effect on the frequency response of the recording system above two cycles/per sec., many of the difficulties of esophageal electrocardiography will have been greatly minimized.

For the use with the Technicon Trigraph, three channel direct writing machine, a resistor-condenser (RC) arrangement in series has been found highly suitable without detectable distortion of the electrocardiographic curves (particularly the RS-T segments).

The function of this specially designed control box is to enable the investigator to record three simultaneous esophageal leads or any combination of esophageal, chest, and intracardiac leads (fig. 1A). A low cut-off filter is placed in series with the lead which is connected to the esophageal terminal (fig. 2). This filter prevents the extraneous, very low frequencies from being amplified and recorded. The rapid changes of the cardiographic complexes pass through the filter without appreciable attenuation.

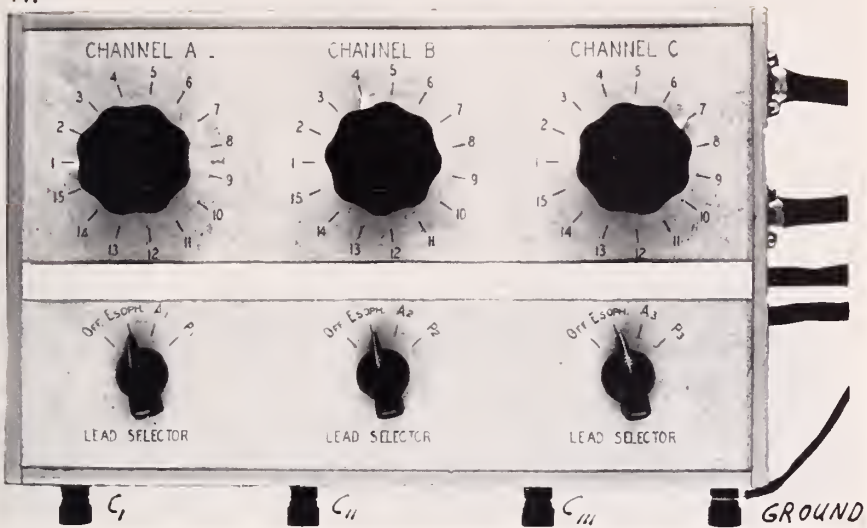
The time constant of the RC filter in the control box is such that when used with the Technicon Cardiograph machine, the response curve at various low frequencies is as shown in the accompanying graph (fig. 3).

The esophageal electrode used at the Mount Sinai Hospital consists of a neoprene tube with fifteen German silver bands, 1.75 cm. apart². Each of these is separately connected to an insulated wire within the tubing leading to a sixteen pole female plug (fifteen electrode terminals with the sixteenth utilized for grounding of the shielding). After the esophageal electrode is positioned under fluoroscopic control, it is connected to the male plug of the three switch assembly the contacts of which are wired in parallel (fig. 1B).

¹ From the Cardiographic Department and the Cardio-vascular Research Group of the Mount Sinai Hospital, New York, N. Y. and the Laboratories of the Technicon Cardiograph Corporation, New York, N. Y.

² Made to our specifications by I. C. Bard, Inc., Summit, New Jersey, to whom one of us (A.G.) feels deeply indebted for their patient and kind cooperation.

A.



B.

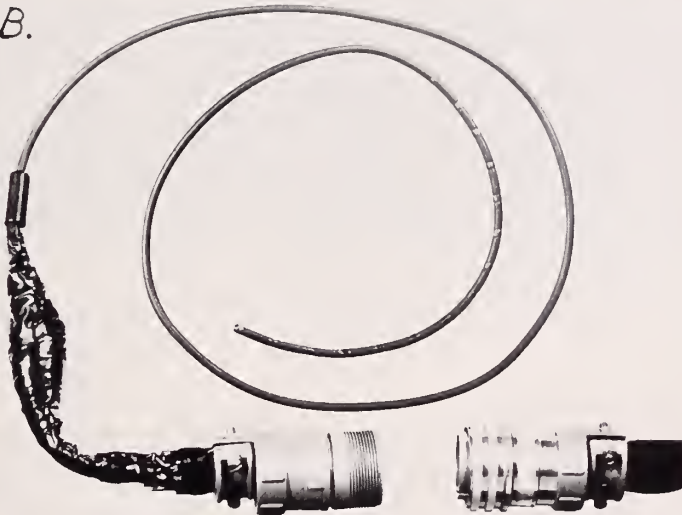


FIG. 1A. Switch assembly panel. Terminals of top switches are wired in parallel for recording of esophageal leads. Leads electorswitch for combining chest, esophageal and intracardiac leads.

FIG. 1B. Esophageal electrode with 15 metal rings 1.75 cm apart.

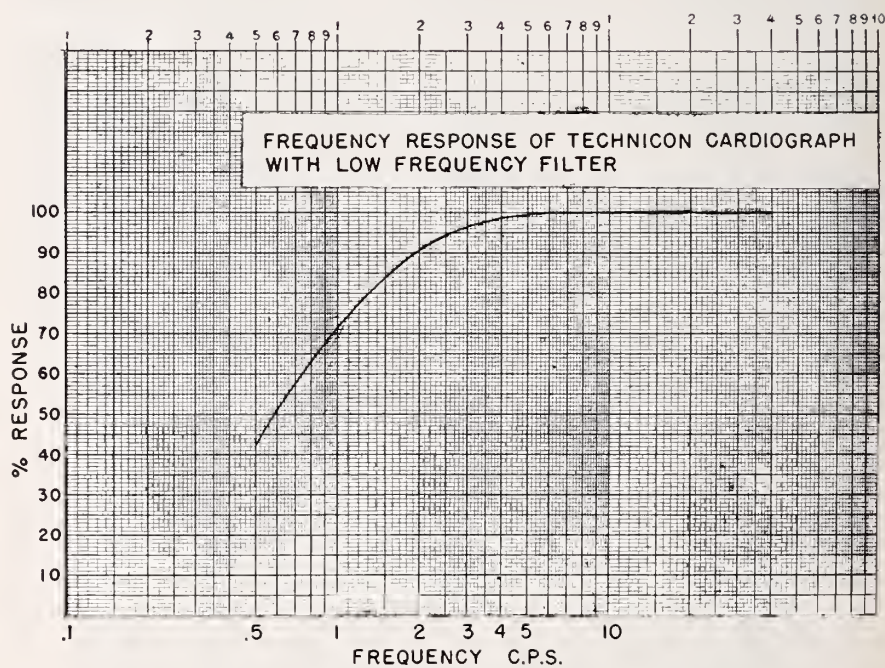


FIG. 2. 3 channel esophageal switch wiring diagram.

The contacts on the 3 Switches are in parallel

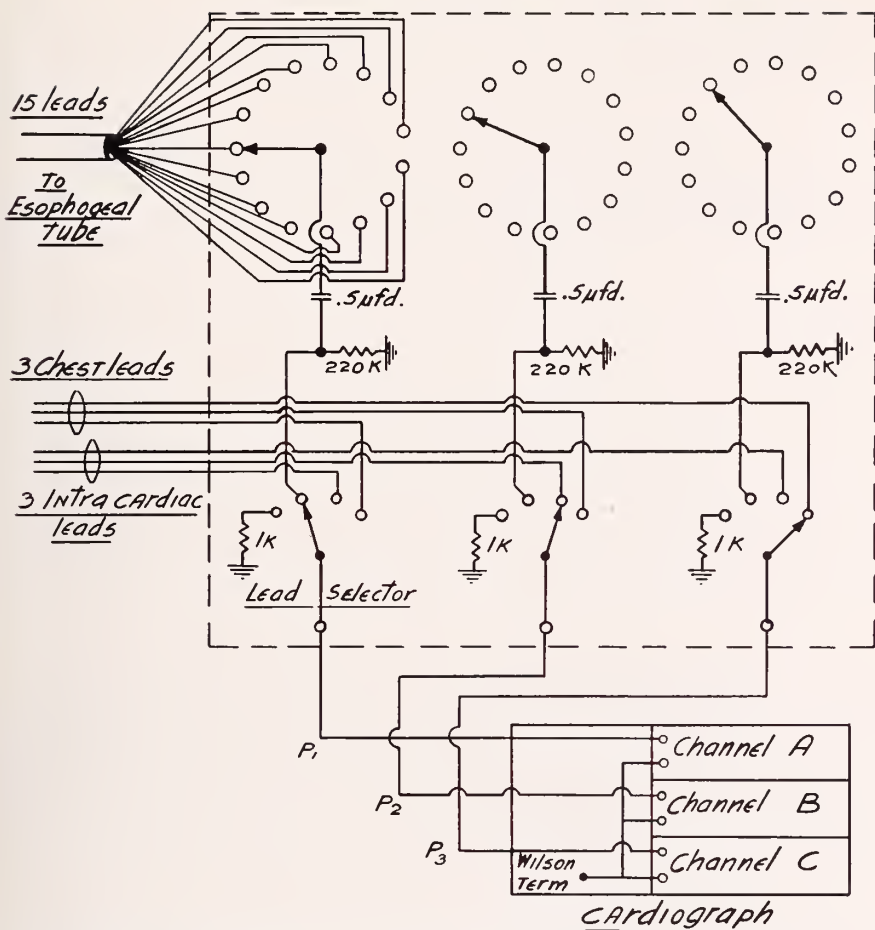


FIG. 3. Frequency response curve of switch assembly when used in conjunction with Technicon Cardiograph machine.

SUMMARY

An RC, low frequency cut-off filter is described suitable for the attenuation of interfering low frequency potentials of gastric, esophageal, or diaphragmatic origin. The altered time constant does not affect the cardiac potentials to a noticeable degree. With this filter, esophageal electrocardiograms can be obtained with greater consistency and ease.

The principle of filter should be applicable to any standard electrocardiographic machine, though the amount of capacity might vary for individual instruments.

ABSTRACTS

AUTHORS' ABSTRACTS OF PAPERS PUBLISHED ELSEWHERE BY MEMBERS OF THE MOUNT SINAI HOSPITAL STAFF

Members of the hospital staff and the out patient department of the Mount Sinai Hospital are invited to submit for publication in this column brief abstracts of their articles appearing in other journals.

Nutritional Requirements in Convalescence. H. POLLACK AND J. BOOKMAN. New York State J. Med., 48: 2706, December, 1948.

The influence of disease or injury on nutrition is less appreciated than the influence of nutrition on disease. The protein requirements for the sick and wounded vary considerably from the normal. There is usually a loss of protein from the body stores. The loss may occur either mechanically, such as through exudate or hemorrhage. The other chief mechanism in the loss of nitrogen is the catabolism induced by the injury. Experimental evidence is presented to demonstrate these points. One must satisfy the basic nutritional requirements of the individual during his period of sickness. In addition, attempts must be made to decrease the depletion effects of catabolism. Data is presented to show the inadequacies of the present therapeutic diets from the point of view of limiting the acute losses and nutritional rehabilitation.

Diabetes Mellitus. H. POLLACK. New York Med., 4: 15, December, 1948.

This article was prepared as a brief review for the general practitioner. It points out the variations in blood sugar concentrations as determined by different techniques. A table of normal limits for the various methods is included. The diabetic diet must be based primarily upon the patient's eating and work habits. The type and quantity of insulin is adjusted after the diet has been selected, since the size and type of the meals will determine the type of insulin required. The differences and the meal patterns of various groups are pointed out. The adequacy of the diabetic diet is based upon the pre-existing nutritional state. The obese patient is restricted in caloric intake to bring about weight loss. It is pointed out that insulin administration must be altered when caloric intake is restricted. Underweight or debilitated patients must have increased food allowances for their nutritional rehabilitation. The use of the antibiotics in the treatment of infections is stressed. Mid-thigh amputations are rare indeed today as compared to the pre-antibiotic era when they were the procedure of choice.

Observation on Surgical Anatomy in the Fenestration Operation. S. ROSEN. Ann. Otol., Rhin. & Laryng., 57: 1007, December, 1948.

Knowledge of the anatomical structures and their relations are of vital importance in the surgery of deafness. The slightest error in technique often results in a poor result or no hearing at all. In the performance of 400 fenestration operations on fresh cadavers observations on the surgical problems and anatomical measurements were made. Measurements were made from the mastoid cortex to the antral floor, of the small space about the malleus and incus, of the relation of the fenestra to the close by facial nerve, and of the size of the fenestra. With these measurements and relations in mind the surgeon is further insured against technical errors.

Cervical Obturation with Inflatable Cannula in Uterotubal insufflation and Hysterosalpingography. I. C. RUBIN AND E. MYLLER. Am. J. Obst. & Gynec. 56: 6, December, 1948.

The importance of cervical obturation in the procedure of uterotubal insufflation and hysterosalpingography has been emphasized. Desiderata of the ideal uterine cannula are: 1. Painless application unaccompanied by trauma. 2. Airtight closure of the cervical canal. 3. Maintenance of the normal anatomical position of the uterus. A new cannula with inflatable balloon for cervical obturation has been described.

Sulfathiazole sensitivity: with a review of the literature. E. L. SERETAN AND A. ALBRIGHT. *Am. J. Ophth.*, 31: 1603, December, 1948.

When sulfathiazole ointment was instilled into the conjunctival sac of a patient immediately postoperatively, a very severe local and general reaction occurred. He had been sensitized to the sulfa drugs when treated for multiple grenade wounds, with local sulfanilamide powder dusted into the wounds. Heroic measures had to be used to curb the severe shock and an Arthus-like phenomenon. This paper is offered as a warning to those treating the many patients who had similarly been sensitized to sulfa drugs previously and who may require sulfa treatment subsequently.

Colonic Adenoma. R. TURELL. *Am. J. Surg.*, 76: 783, December, 1948.

The author's sigmoidoscopic studies of 386 individuals under 45 years of age who had not had intestinal complaints revealed an incidence of about 2 per cent of adenomas exclusive of mucosal excrescences which are regarded as tiny adenomas by some authorities. A similar study of an equal number of somewhat older patients who complained of bleeding from the rectum revealed an incidence of about 7 per cent of adenomatous polyps. The propensity of colonic adenomas to undergo malignant transformation is stressed. The details of biopsy procurement as well as of therapeutic procedures are discussed and profusely illustrated.

The Effect of Hyaluronidase on the Absorption of a Subcutaneously Deposited Radiopaque Substance. N. SIMON AND L. NARINS. *Am. J. Roentgenol.*, 61: 91, January, 1949.

The effect of hyaluronidase to increase absorption of subcutaneously deposited substances through its capacity as a spreading factor was studied roentgenologically. A radiopaque substance was deposited subcutaneously in guinea pigs with and without previous preparation of the subcutaneous sites with hyaluronidase. Serial roentgenograms were taken to determine the disappearance of the subcutaneously deposited substance. By this method it was amply demonstrated that hyaluronidase greatly increases the removal of subcutaneously deposited substances into the blood stream.

Trephine Biopsy of Bone with Special Reference to the Lumbar Vertebral Bodies. S. SIFFERT AND A. M. ARKIN. *J. Bone & Joint Surg.*, 31: 146, January, 1949.

The unsatisfactory specimens obtained from bone by use of the conventional types of biopsy needles led the authors to develop a trephine needle, which fits within a guiding cannula, and with which relatively large cores of bone could be bored. The architecture of the specimens was almost universally maintained intact. Although the needle finds great use for office biopsy of superficial bone lesions under local anesthesia, the authors feel that when a lesion is accessible surgically, the specimens obtained are so far superior, that the operative procedure is always preferred. In inaccessible areas, such as the vertebral bodies, the needle finds its greatest use. In relatively inaccessible areas such as the ischium, and acetabulum, needle biopsy with the trephine needle has made extensive surgery unnecessary.

Sympathectomy in Peripheral Arteriosclerosis. E. E. JEMERIN. *Ann. Surg.*, 129: 65, January, 1949.

The rationale for the present trend toward the use of sympathectomy in peripheral arteriosclerosis is discussed. The presence of a vasospastic element even in advanced cases seems to have been demonstrated. This vasospastic element superimposes itself upon the

already narrowed vessels and collaterals in response to the influences of cold, of emotion and of standing. With sympathectomy, a complete release of vasomotor tone is obtained, insuring an even blood flow, uninfluenced by anything but the metabolic needs of the tissues. Eight lumbar sympathectomies upon 6 patients are reported. All had advanced states of peripheral arteriosclerosis with manifestations varying from intermittent claudication to frank gangrene with or without infection. In 7 instances, definite benefit resulted. In the 8th, frank gangrene had spread beyond the middle of the foot and all that was hoped for was to make possible the healing of an amputation at a mid-leg level. This was achieved, but it could not be concluded that the sympathectomy was responsible. In the other cases, both objective and subjective evidence of definite improvement was obtained. In 2, incapacitating claudication was relieved. In the remainder, gangrene involving 1 or more toes with accompanying infection was present. In all, only the toes were lost and there was a marked objective improvement in the circulatory status with a relatively asymptomatic use of the remainder of the member. The basis for selection of cases for sympathectomy is discussed and an appeal made for its trial in such cases.

Foreign Body in Thyroid Following Perforation of Esophagus. E. E. JEMERIN AND J. S. ARONOFF. *Surgery*, 25: 52, January, 1949.

Three cases of a hitherto undescribed sequence of events following foreign body perforation of the cervical esophagus are reported. In each case, the foreign body (a chicken bone in 2 and a fish bone in 1) perforated the esophagus and lodged in the thyroid gland. An abscess within the thyroid gland resulted. Contamination of the retroesophageal space was minimal. The diagnosis is suggested by swelling and tenderness of the corresponding lateral thyroid lobe in addition to the customary symptoms and signs of cervical esophageal perforation. Treatment consists of the establishment of external drainage through the neck and removal of the foreign body. If the foreign body is not retrieved, relief may prove to be only temporary.

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CARDIAC RESUSCITATION*

JULIAN JOHNSON, M.D., D. Sc. (Med).† AND CHARLES K. KIRBY, M.D.‡

Cardiac resuscitation has proved to be a relatively dependable and reliable life-saving procedure. As in many other fields, the number of successes increases as the interest in the problem grows. Time is a most important factor, since the duration of the cessation of blood flow which may be survived is strictly limited. The brain must not be deprived of oxygenated blood for more than three or four minutes. Within this short period of time the surgeon must produce adequate blood flow by cardiac massage and the anesthetist must insure adequate oxygenation of the blood by ventilation of the lungs.

Since cardiac arrest is an emergency in which one cannot wait for a consultation, it is important for every surgeon and anesthetist to understand the various aspects of the problem.

ETIOLOGY

The cause of cardiac arrest has a great deal to do with the prognosis. Thus when one is thinking of cardiac resuscitation, death from the usual medical causes is not included. Success can seldom be expected unless the emergency arises in the operating room.

A favorable situation for cardiac resuscitation is that in which a patient with a normal heart has received an overdose of an anesthetic. Here the problem is simply that of producing artificial circulation and respiration until enough of the anesthetic agent is removed or destroyed to allow the heart to start beating again. This includes not only patients under general anesthesia but also those who are sensitive to or have received an intravenous injection of a local anesthetic.

Another favorable situation for resuscitation is that in which the heart stops suddenly without a demonstrable lesion, or anoxia, or an overdose of an anesthetic as the apparent cause. This sudden unexpected cardiac asystole has been attributed to reflex phenomena (vago-vagal reflex). Whatever the cause, such a heart will usually start beating again rather readily if cardiac massage is started within three minutes.

When cardiac arrest or ventricular fibrillation is incident to anoxia, the brain and the heart may have been damaged considerably before cardiac action ceased. The period of arrested circulation which can be tolerated is decreased accordingly.

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DIAGNOSIS

Delay in diagnosis is the chief cause of failure in cardiac resuscitation. The anesthetist must maintain constant observation of the patient if he is to notice asystole the moment it occurs. Having noticed the absence of a pulse or blood pressure the question always arises as to whether the heart is beating so feebly as to be undetectable, or whether the heart is in standstill or in ventricular fibrillation. In many instances a fatal delay is caused by futile efforts to confirm the diagnosis before proceeding with the proper treatment.

If the surgeon happens to be operating in the vicinity of the heart or a large artery he may immediately confirm the diagnosis by putting his hand directly on the heart or large artery. If the surgeon is operating in the abdomen his first reaction should be to feel the heart through the diaphragm.

Auscultation of the chest is not apt to be helpful when the pulse and blood pressure are not obtainable. If the heart is beating so feebly as not to give a pulse or sustain the blood pressure, it is unlikely that it can be heard with a stethoscope. Time spent by the surgeon looking for a stethoscope if one is not immediately available is time ill spent.

It has been reported that one may diagnose cardiac arrest immediately with an ophthalmoscope (1). It is said that the retinal arteries will not be visible and the column of blood in the veins will be broken into short segments. We are convinced on the basis of personal experience that this method is of no practical value.

It has been suggested that the absence of capillary refill indicates cardiac arrest. We have found, however, that the phenomenon of capillary refill does not disappear immediately when the heart stops.

If one happens to have an electrocardiograph attached to the patient at the time of cardiac arrest, it may be very helpful, particularly if the patient goes into ventricular fibrillation. Negrovski (2) has observed, however, that the heart may produce an electrocardiogram, although an abnormal one, for some time after it has stopped beating.

It becomes obvious from the above that the only reliable, rapid method of determining whether the patient has cardiac arrest, unless the patient happens to have an electrocardiograph attached at the time, is to see or feel the heart or a large artery. We are convinced, therefore, that the surgeon should take the point of view that opening the thorax to feel the heart is a diagnostic procedure. If the anesthetist cannot obtain a pulse or blood pressure, the surgeon must accept his observations and open the chest without losing valuable time in attempting to confirm these observations or to make a diagnosis of cardiac arrest by time-consuming and perhaps unreliable diagnostic procedures.

Once the decision has been made to open the chest the surgeon should be prepared to do so with the greatest dispatch. Every surgeon should be prepared to meet this emergency. The surgeon needs only a pair of gloves and a scalpel. Given these, he should have his hand on the heart within ten to fifteen seconds. Skin antiseptics and sterile drapes are refinements which can be added when available, but their absence should not cost the patient his life.

The incision should be made in the fourth interspace from about the edge of the sternum to the mid-axillary line. Since there is no bleeding, the incision can be carried quickly through the chest wall and pleura. This should not be done with one stroke of the knife for fear of cutting into the lung or heart. The surgeon can put one hand between the 4th and 5th ribs to feel the heart. The diagnosis will be apparent immediately. If arrested, the heart will be still and if in ventricular fibrillation it will feel like a "bag of worms."

TREATMENT

In the presence of cardiac asystole the problem is one of producing adequate blood flow by cardiac massage and adequate oxygenation of the blood by artificial ventilation of the lungs.

Respiration. Adequate respiration can be maintained with an anesthesia machine, by manual compression of the breathing bag. A tight-fitting face mask is satisfactory. It is not wise to take time to insert an endotracheal tube until the patient is again well oxygenated. One hundred per cent oxygen should be used.

If the emergency should arise outside of the operating room, the patient's lungs should be ventilated by the mouth-to-mouth technique, until other equipment becomes available.

Circulation. As soon as the surgeon puts his hand on the heart and finds it is not beating he should start compressing it rhythmically. If a rib spreader is not immediately available, he should divide the fourth and fifth cartilages with a knife or scissors in his left hand as he compresses the heart with the right hand in order to gain better exposure and prevent the ribs from pressing against his hands. Even after this the rib spreader is of great help. Following cardiac massage a few open vessels will begin to bleed and must be caught as soon as hemostats are available.

There are a number of factors which greatly influence the effectiveness of the blood flow produced by cardiac massage.

1) Rate of Cardiac Massage. A review of the literature reveals a difference of opinion as to the rate at which the heart should be compressed. Most writers recommend twenty to forty times a minute, in order to allow the ventricles to fill adequately, while a few have suggested a normal rate.

Because of this difference of opinion we recently studied the problem in dogs. The results are reported elsewhere (3). Using the bubble meter of Dumke and Schmidt in the thoracic aorta, it was found that a greater blood flow was produced when the heart was compressed at a rapid rate. Rates of 30, 60 and 120 per minute were compared. In all instances the blood flow increased as the rate of compression was increased regardless of whether the heart felt full or empty.

As the result of these experiments we became convinced that in clinical use one should compress the heart as rapidly as possible, up to 120 times per minute. The fatigue of the operator makes a rate of 120 times per minute impossible for more than a few minutes, whereas he can continue for a much longer time at sixty to eighty times per minute. If there are two or more operators who can take turns, a faster rate may be constantly maintained.

2) Technique of Cardiac Massage. In the laboratory it was found that some practice was required to produce an effective blood flow by cardiac massage. The dog's heart can be compressed most effectively by placing the thumb in front and the fingers behind. It was found that the blood flow produced by compressing the heart against the anterior chest wall was only about one-half as great as by the above method. Only one-fifth as much blood flow could be produced by compressing the heart through the diaphragm.

The amount of blood flow produced by artificial respiration alone was too small to be measurable by this technique. Any hope that artificial respiration is an effective method of producing blood flow should be abandoned.

A small human heart may be compressed with one hand, as in the dog. The usual adult heart can be more effectively compressed, with less effort, by placing one hand in front and one behind the heart.

3) Blood Volume. It was found in the laboratory that the filling of the heart is very important in producing an effective blood flow even though it was not profitable to wait for it to fill between cardiac compressions. The cardiac output varied directly with the rate. Nevertheless the cardiac output could be significantly increased by rapid transfusion of blood, plasma or plasma substitutes. When intravenous fluids were given rapidly the heart could be felt to fill more completely and the cardiac output was found to be increased even though the compression rate remained the same. Some care is necessary to prevent over-transfusion.

4) Diversion of Blood Flow. In most instances the heart will resume beating fairly soon if it is going to do so. Occasionally, it may start up after a prolonged period of artificial respiration and circulation. In such instances it may be well to divert a good part of the blood flow to the brain since it is most quickly affected by anoxia, whereas in normal adults the descending thoracic aorta can be clamped for 30 minutes with no ill effects. We were able to show that the carotid blood flow was greatly increased by occluding the aorta.

Drugs. We have felt that no drugs are helpful in getting the heart to start beating again. Once the heart has started epinephrine may be useful in increasing the tone of the cardiac muscle and the effectiveness of its contraction. We have seldom used it. It does increase the probability of ventricular fibrillation. Procaine may be useful to decrease the likelihood of the development of ventricular fibrillation, and in restoring normal rhythm in the event of ventricular fibrillation. We use it routinely.

Ventricular Fibrillation. If, when the thorax is opened, the heart is found to be in ventricular fibrillation, or if it should develop during the cardiac massage, the problem takes on another aspect.

The usual causes of ventricular fibrillation are anoxia, mechanical trauma, electric shock and drugs which increase the irritability of the heart. Clinically, anoxia results commonly from coronary occlusion, or respiratory obstruction during anesthesia. The heart may be stimulated by manipulation during many intrathoracic operations but ventricular fibrillation has occurred most commonly during operations upon the heart and pericardium. Local and intravenous pro-

caine have been shown both experimentally and clinically to protect the heart against irregularities resulting from mechanical stimulation.

In rare instances ventricular fibrillation has reverted to normal rhythm spontaneously. In some the use of procaine may cause reversion, but electric shock therapy, developed by Wiggers (4) and by Beck and Mantz (5) must usually be employed. This method of treatment is based on the observation that passage of a strong current through the heart will cause a simultaneous contraction of all the incoordinated, fibrillating fibers, and relaxation follows. The heart is then in standstill. In animals the spontaneous heartbeat resumes after a short period of cardiac massage. In all of the patients' hearts defibrillated by us, the spontaneous heartbeat has begun after a short interval of standstill.

Before defibrillation is attempted, anoxia must be overcome by cardiac massage and artificial ventilation of the lungs with 100 per cent oxygen. Three cubic centimeters of 2 per cent procaine are injected into the right ventricle and an equal amount into the pericardial cavity unless procaine has previously been given intravenously. The resistance on the defibrillator is set so that using alternating current (60 cycles), 1.5 amperes is developed when the electrodes are placed in contact with each other. The electrodes are then placed on each side of the ventricles and current is passed through the heart for less than a second. Repetition of the shock may be necessary. The strength of the current is of importance, for it has been shown that, in animals, 0.4 amperes for five seconds will cause fibrillation, whereas 0.8 amperes or more will stop it. A current of 0.8 amperes will not cause fibrillation and 0.45 amperes will not stop it.

The amount of current which passes through the heart will be influenced by the resistance offered by the muscle mass of the heart. It may be important, especially in large hearts, to press the electrodes firmly against the heart and avoid contact with the rest of the thorax in order to get adequate current through the heart muscle mass. Unless the patient's entire body is thrown into muscular contraction, the current is probably not strong enough.

CLINICAL EXPERIENCE

Cardiac arrest and ventricular fibrillation are catastrophes which may occur from time to time on any active surgical service. Reports of our experience with these problems have been made from time to time (6, 7). The present report is confined to the experience at the Hospital of the University of Pennsylvania during the five-year period from January 1, 1946 to December 31, 1950.

During this five-year period approximately one thousand operations per month were done, and attempts at cardiac resuscitation were carried out on twenty patients. Eleven of the patients were in the operating room or anesthesia room or undergoing cardiac catheterization when the catastrophe occurred and, of these, eight survived. Of the nine attempts made outside the operating room, none was successful. Without exception, failures at resuscitation could be attributed to delay in diagnosis and treatment, or to pre-existing lesions which made success highly unlikely.

As the experience in this hospital has grown, the concept of opening the thorax

quickly in cases of suspected cardiac arrest has been repeatedly stressed to the personnel of the departments of Surgery and Anesthesiology. As a result, three of the eight patients who survived owe their lives to members of the resident staff who, upon the advice of the anesthetist, acted quickly without the delay of consultation.

In taking the point of view that opening the thorax is a diagnostic procedure when the anesthetist cannot obtain the pulse or blood pressure, it is inevitable that the chest will occasionally be opened when the heart is beating feebly. This occurred once in this series and, fortunately, this was in a thoracic patient, whose operation was then performed through the same incision. There is little doubt that more lives will be lost by delay in thoracotomy when cardiac arrest is present than by proceeding with thoracotomy when the heart is beating feebly.

Table I summarizes the experience at the University Hospital in the last five years.

TABLE I
Calculated constants of aqueous sucrose solutions
Assumed: $k_1 = 2.57$; $Q = 0.6$; $k_2 = 3.175$

TEMPERATURE	y_0	y_0	D_s	q_0	$-q_1$	q_2	h_0	r_2	DII	H_0
°C.										
0	0.6000	0.0250	1.624	0.347	0.288	0.059	1.818	2.098	1.102	10.54
0	0.5900	0.0375	1.631	q 's assumed as above			1.828	2.106		
18	0.6025	0.0750	1.636	0.381	0.290	0.051	1.672	2.012	1.130	8.82
25	0.6046	0.0740	1.558	0.413	0.351	0.087	1.468	2.454	1.203	6.87

The chance of success is maximum during thoracotomy since there is no delay in diagnosis. One of our patients had ventricular fibrillation during a mitral commissurotomy. Electric shock and procaine were used with success. Another patient had cardiac arrest during a lobectomy. This case is perhaps an example of a vago-vagal reflex since the vagus nerve was being manipulated while elevating the pleural flap at the time the heart stopped.

The two patients with cardiac arrest during the induction of anesthesia were revived quite promptly by cardiac massage. They probably represent a vago-vagal reflex in the presence of some anoxia.

Of the five patients being operated upon for other than thoracic conditions only two were revived. One occurred during a Rubin test under general anesthesia and required electric shock for ventricular defibrillation. The other patient was undergoing a laparotomy but the thorax was opened for cardiac massage. The three failures represented delays in diagnosis. One was a colored patient with a toxic thyroid in whom anoxia was the dominant factor. His heart was defibrillated by electric shock but he was decerebrate and lived only five days. The second had a "total" spinal anesthesia for an appendectomy. There was too great delay before the heart was started by trans-diaphragmatic massage and the patient died decerebrate in two days. The third was a patient undergoing a

thoracolumbar sympathectomy and anoxia was the principle factor. He lived, partially decerebrate, for 39 days.

The diagnosis was made immediately on two patients who developed ventricular fibrillation during cardiac catheterization since an electrocardiogram was running at the time. In spite of some delay in getting a surgeon, both of these patients recovered completely following defibrillation by electric shock.

Eight patients were subjected to thoracotomy in the recovery ward or in a surgical ward or private room from 15 minutes to three days after operation. All of these efforts failed. Five of the eight were healthy young individuals who died of anoxia due to depressed respiration or an obstructed airway. These deaths must be attributed to inadequate observation. The remaining three patients died of their disease or of its complications and success could hardly have been anticipated.

The one medical patient, aged 73, apparently died of arteriosclerotic heart disease, but she happened to be on the operating floor waiting for a cystoscopic examination when she died. She was defibrillated and was partially clear mentally when she died a second time three days later.

If one considers the number of cases of attempted cardiac resuscitation by years, there were eight in 1950; five in 1949; two in 1948; three in 1947; and one in 1946. The increase has been due in part to the enthusiasm for opening the thorax of patients dying on the surgical wards. However, of the eight patients in 1950, four were cardiac surgery patients such as might not be seen in the average general hospital.

Since the opportunity for successful cardiac resuscitation outside of the operating room or its equivalent seems definitely limited, let us consider the attempts made in the anesthesia or operating rooms by years.

	1946	1947	1948	1949	1950	TOTAL
Lived.....		1		3	4	8
Died.....	1	1	1			3

It would seem that our educational campaign has been definitely worth while. Only one out of four attempts was successful in 1946-1948, whereas seven out of seven attempts were successful in 1949-1950. Resident surgeons were responsible for three of these successes.

SUMMARY

1) The methods and techniques which had proved successful in resuscitating patients with cardiac arrest and ventricular fibrillation have been discussed.

2) Success in cardiac resuscitation depends upon the restoration of the flow of oxygenated blood to the brain within three to four minutes. All other considerations are of secondary importance.

3) Since the time limit of three to four minutes cannot be exceeded when this emergency arises, all surgeons and anesthetists should become familiar with the technique of cardiac resuscitation.

4) During a five-year period eight lives were saved by cardiac resuscitation at the Hospital of the University of Pennsylvania.

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THE CORRELATION OF SPATIAL VECTORCARDIOGRAPHY WITH INTRACARDIAC AND ESOPHAGEAL LEADS*

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At any one instant, the electromotive forces of the heart may be represented by a spatial vector which has magnitude, direction, and sense (1, 2). The terminus of this instantaneous vector will describe a loop during the time consumed by the spread of the wave of accession over the myocardium. The spatial orientation of this vector loop may be obtained by the means of a cube form of geometric representation, and recorded by simultaneous projections onto the horizontal, sagittal, and frontal planes (3).

The great value of unipolar leads in an electrocardiographic study lies in their ability to record an essentially true picture of the total resultant electromotive forces as they are represented at any one point. When the position of a unipolar electrode is known in relationship to the electromotive center of the heart, one should be able to derive the form of the electrocardiogram from the spatial vectorcardiogram.

The projection of the spatial vector loop onto the frontal plane may thus be correlated with the standard and unipolar extremity leads, the sagittal plane with multiple esophageal leads, and the horizontal plane with multiple thoracic leads. Very close correlation has already been demonstrated in both normal (4) and in a large variety of abnormal electrocardiographic patterns (5, 6). In these studies, the exploring electrode was always "extracardiac" in position.

The present study was undertaken in an attempt to determine whether intracardiac electrocardiograms could also be derived from spatial vectorcardiograms.

METHODS

Intracardiac electrocardiograms and spatial vectorcardiograms obtained in 9 persons, were used for this analysis.¹ The electrocardiographic diagnoses included 2 normal patients, 2 patients with right ventricular hypertrophy, 1 with right bundle branch block and 4 with left ventricular hypertrophy. The intracardiac leads were obtained by inserting a flexible intracardiac electrode into a right or left brachial vein and introducing it into the right atrium, ventricle and eventually far distally into the pulmonary arteries. The electrode was then gradually withdrawn under constant fluoroscopic control and electrocardiograms were taken at frequent intervals. Whenever an electrocardiogram was recorded, a spot film of the electrode's position was obtained. On the average, 15 to 25 points were explored between one or both pulmonary artery branches and the right or left brachial vein. Suitable precordial, extremity, or esophageal leads were used as simultaneous reference leads.

The vectorcardiograms of the horizontal, sagittal and frontal plane projections of the spatial vectorcardiogram were simultaneously visualized by means of a Tri-beam Technicon Vectorscope and a Technicon Cardiograph machine, and photographed on a single film. The details of the method employed have been reported upon previously (3). Three pairs of

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¹ The intracardiac leads were recorded by one of us (A. G.) in association with Drs. M. F. Steinberg and I. G. Kroop.

electrodes were placed on the thorax so that they comprised three adjoining edges of a cube. Each electrode was essentially equidistant from the assumed electrical center, E, of the heart.

Esophageal electrocardiograms were recorded in 5 of the subjects with a specially constructed esophageal tube containing fifteen equidistant electrodes 1.75 cm. apart (7, 8). The position of the lowermost electrode, E₁, was determined fluoroscopically and a permanent record obtained by means of a spot film. Reference leads, both intracardiac and precordial, were obtained simultaneously.

Also recorded in each person were the standard and unipolar extremity leads, and multiple unipolar thoracic leads.

The records were then analyzed as follows (the details of these methods have been described elsewhere (4)):

1. The standard and unipolar extremity leads were correlated with the frontal plane projection of the VCG.

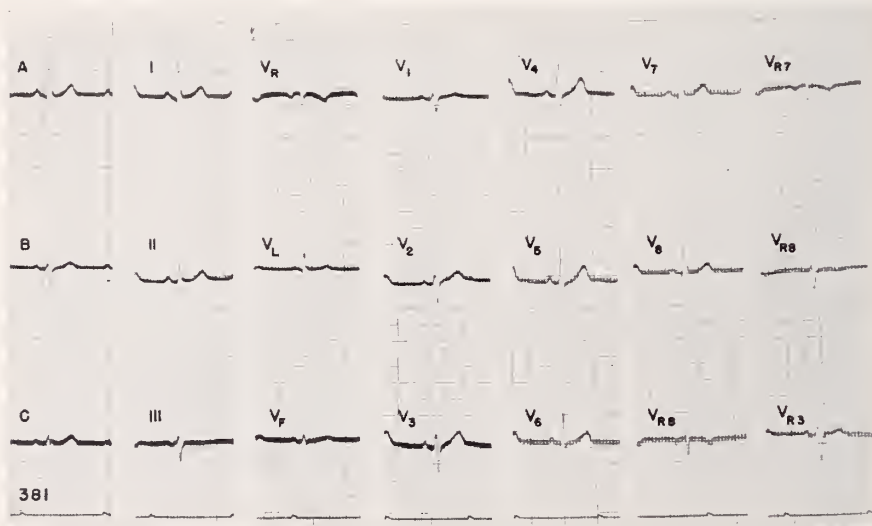


FIG. 1. 381: M. K., 77 year old man. Conventional electrocardiograms. See text for details.

2. The esophageal leads were correlated with the sagittal plane projection.

3. The multiple thoracic leads were correlated with the horizontal plane projection.

The spatial relationship of the exploring intracardiac electrode to the assumed electrical center E was an essential feature of the present study. In each case, a point of transition was encountered where the intracardiac electrocardiogram rather suddenly changed in orientation from being essentially upright to inverted, or *vice versa*, for either the QRS complex, or T wave, or both. There were sufficient electrocardiograms available in each case to permit the localization of E by its vertical, sagittal and horizontal components. All subsequent determinations were then made using this point in space as E. Subsequent electrode positions were then located on the appropriate plane with the help of the numerous x-rays available.

ILLUSTRATIVE CASES

Of the 9 cases analyzed the results in 2 are given in detail. There was good correlation obtained in each case.

Case 1: (VCG 381) M. K., a man aged 77 years. The conventional electrocardiogram revealed regular sinus rhythm, and was an essentially normal record (fig. 1). Multiple esophageal

leads (fig. 2) were recorded, E_1 representing the lead obtained with the electrode in the lower esophagus, and E_{10} at supracardiac levels. E_1 revealed a notched R pattern. The R wave then became smaller and eventually disappeared with the pattern remaining QR in configuration until E_8 . The terminal R wave then decreased markedly in amplitude but persisted even at supracardiac levels. An intrinsic atrial deflection was present in E_2 - E_9 . (The tip of the esophageal electrode was not inserted into the stomach in this case.)



FIG. 2. 381: Esophageal electrocardiograms. See text for details. E_1 is recorded at lower esophageal levels; E_{10} at supracardiac levels. In each record, the lower tracing is V_1 which is simultaneously recorded. The upper tracing is the esophageal lead.

Intracardiac electrocardiograms (fig. 3 A-B) were recorded at numerous regions in the great vessels and cardiac chambers. With the exploring electrode in the left pulmonary artery, the ventricular complex was rS in configuration, and the T wave was upright. In the right pulmonary artery, to the right of the mid-line, the pattern was rS with the S wave being slurred at its terminal portion. The T wave was inverted. In the proximal portion of the main pulmonary artery and in the pulmonary conus, the terminal portion of the S wave was notched, and the T wave inverted. In the right ventricle, near the tricuspid area, the ventricular complex was rS, and the T wave inverted. Throughout the right atrium, and also in the right innominate vein at its junction with the superior vena cava, a similar pattern was obtained.



FIG. 3A. 381: Spot films of esophageal and intracardiac electrodes. In film 2, catheter tip is in the left pulmonary artery; in film 3, in the right pulmonary artery.

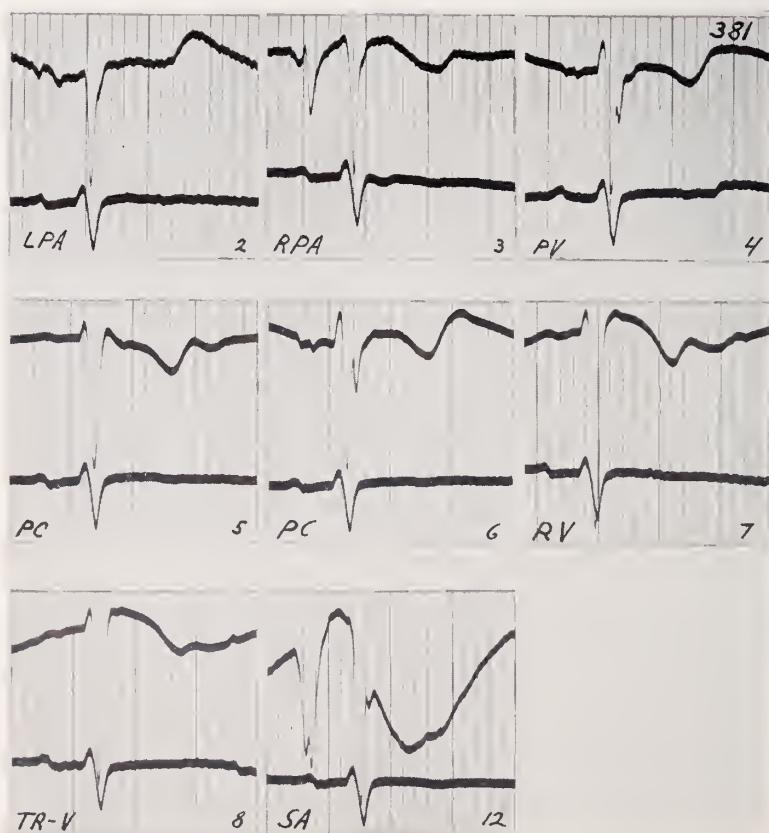


FIG. 3B. 381: Intracardiac leads. See text for details. (L.P.A.: left pulmonary artery; PV: pulmonic valve area, P.C.: pulmonic conus area; R.V.: right ventricle; TRV: tricuspid valve; S.A.: sinus node region). In each record, the upper tracing is the intracardiac electrocardiogram, and the lower is V_1 which is recorded simultaneously.

The QRS $s\dot{E}$ loop in the horizontal plane projection of the spatial vectorcardiogram was initially inscribed to the right and anteriorly, and then sharply to the left. The terminal portion of the loop was inscribed posteriorly. In the sagittal plane projection, the initial inscription was anterior and inferior (partially obscured by the T $s\dot{E}$ loop), and then sharply posterior. The QRS $s\dot{E}$ loop in the frontal plane was inscribed initially to the right, and then sharply to the left. The T $s\dot{E}$ loop was somewhat anterior, inferior, and to the left of the QRS $s\dot{E}$ loop (fig. 4).



FIG. 4. VCG: 381 Vectorcardiogram. (H: horizontal projection; S: sagittal projection; F: frontal projection). The arrow indicates the direction of inscription of the loop. See text for details.

CORRELATION

A. *Conventional electrocardiograms:* Leads I, II, III, VR, VL, and VF as recorded correspond quite closely in timing and direction to those derived by superimposing the frontal loop on the triaxial system of Bayley to which the axes of derivation of VR, VL, and VF are added. The essential similarity of lead I to bipolar lead A (the horizontal component of the cube representation), and of VF to bipolar lead C (the vertical component of the cube representation) is apparent.

When the axes of derivation of the multiple thoracic leads are superimposed on the horizontal plane projection, good correlation is again seen between the recorded and derived scalar electrocardiograms. The initial deflection of the QRS $s\dot{E}$ loop to the right and anteriorly inscribes an R wave in right precordial leads, and a Q wave in left precordial leads. The latter deflection to the left inscribes an R wave in the scalar electrocardiograms recorded on the left precordium, and an S wave on the right.

B. *Esophageal leads:* These leads were correlated with the sagittal plane projection of the vectorcardiogram. The initial deflection of the loop anteriorly and inferiorly inscribes an R wave in VF and lower esophageal leads (E_1 - E_3). The Q wave of the QR pattern is inscribed by the deflection anteriorly and inferiorly (Q wave) and the R wave by the posterior return of the QRS $s\dot{E}$ loop. At supracardiac levels, the projection of the loop is primarily on the negative side of the axis of derivation so that the size of the R wave diminishes at higher levels. The T wave is essentially isoelectric everywhere except for slight inversion in the most superior lead.

C. *Intracardiac and great vessel leads:* The configurations of the patterns obtained within the right innominate, and the extremity lead VR were quite similar both as to the QRS complex and T wave. Both of these leads were located along essentially the same axis of derivation.

The QRS complex was rS in configuration wherever recorded in the great vessels or cardiac chambers, the only dissimilarity being the slurring and late notching of the S wave in the right pulmonary artery and the outflow tract of the right ventricle. An rS pattern is to be expected in this case whenever an electrode is to the right of E or directly anterior since the initial deflection of the QRS $s\dot{E}$ loop is initially to the right and anteriorly. (This

is true unless the axis of derivation is almost directly posterior or superior to E.) The slurring or notching is attributable to the almost 90° angle seen on the return limb of the QRS sE loop in the horizontal plane. The S wave is slurred when such a QRS loop is recorded whenever the return loop is essentially perpendicular to the axis of derivation, such as in a lead somewhat posterior and to the right of E.

The T sE loop is oriented entirely to the left of E, and somewhat anterior and inferior. The T loop appears smaller in the sagittal projection since it is seen "on end." However, by correlation with the horizontal and frontal projections, it is apparent that the T loop points to the left and hence away from the observer. Due to this orientation, leads to the left of E and anterior to E will record an upright T wave, while leads to the right will record an inverted T wave. (A negative T wave will also be recorded if the axis of derivation is directed superiorly or posteriorly.) The only position in which an upright T wave was recorded in this patient was in the left pulmonary artery.

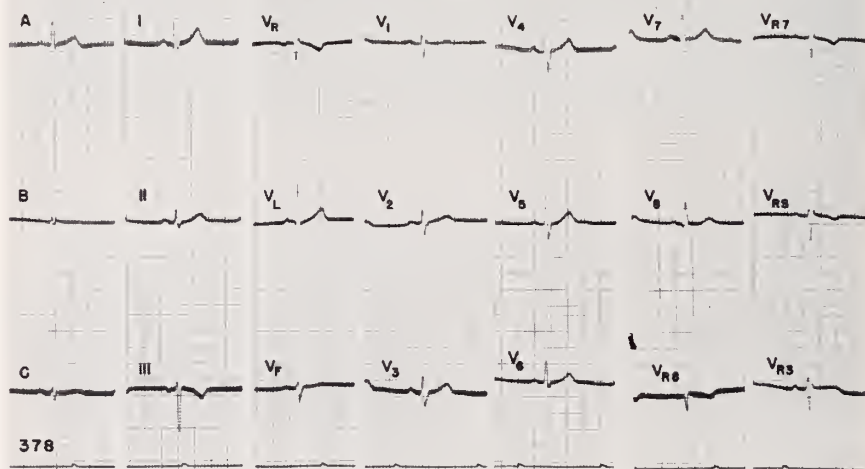


FIG. 5. 378: T. F., 49 year old man. Conventional electrocardiograms. See text for details.

In this patient, therefore, the exploring electrode was always oriented to the right of E and did not vary sufficiently in the sagittal or vertical direction to be so situated that the axis of derivation ever projected on an initially negative deflection of the QRS sE vector loop. An upright T wave in the presence of an rS pattern of the ventricular complex was inscribed in the left pulmonary artery. This configuration is only to be expected if the exploring electrode lies slightly anterior and somewhat to the left of E which is apparently the position occupied by the electrode in the left pulmonary artery in this patient. An electrode in the right pulmonary artery lies to the right, and thus records an inverted T wave.

Hence, in this patient, the intracardiac and great vessel leads can be derived from the vectorcardiogram.

Case 2: (VCG 378) T. F., a 49 year old white man. The conventional electrocardiogram revealed regular sinus rhythm and was characterized by the presence of a terminal broadened R wave in V_R , and an rSr' pattern in V_{R7} , V_{R5} , V_{R3} , and V_1 . The S wave in V_6 was shallow and .04 second in duration. The usual interpretation of such a record is partial or incomplete right bundle branch block (fig. 5).

Multiple esophageal leads were recorded (fig. 6), with E_1 representing the lead obtained

with the electrode in the lower esophagus, rather than the usually preferred position in the stomach. E_1 was rS in configuration. By E_2 , however, the R wave became insignificant and then disappeared by E_3 . The E_3 - E_6 patterns were QS in configuration with the terminal portion of the S wave being characterized by a notch which occurred progressively later from E_2 to E_6 . From E_7 to E_{15} , the pattern was QR in configuration, with the R wave being

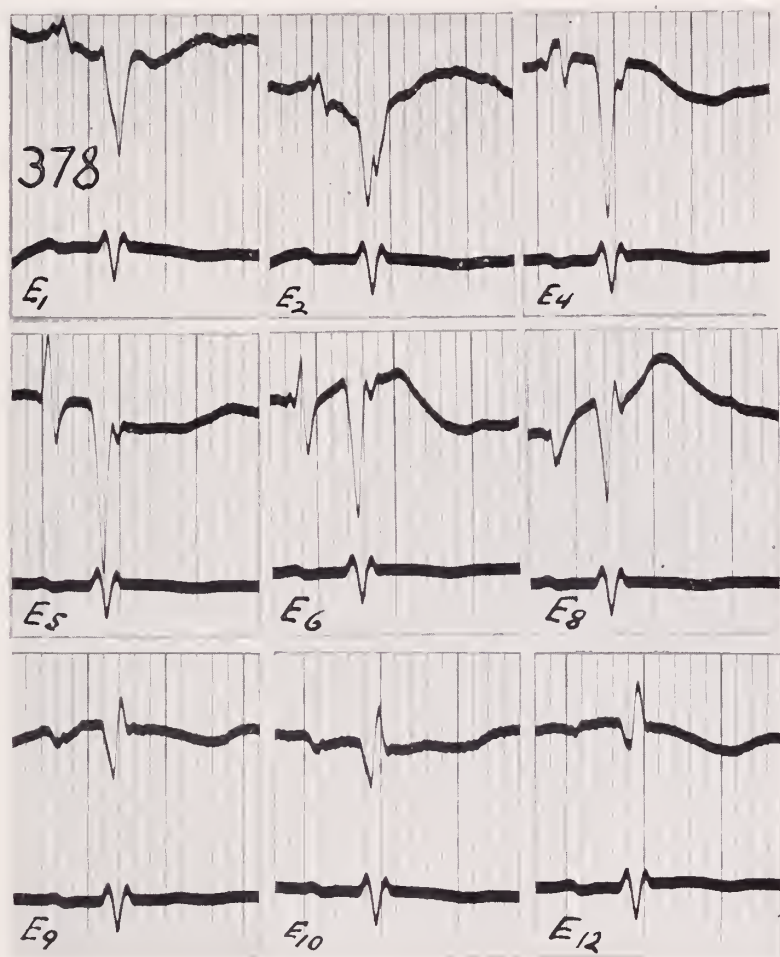


FIG. 6. 378: Esophageal electrocardiograms. See text for details. E_1 is recorded at lower esophageal levels; E_{12} , at supracardiac levels. The upper tracing in each record is the esophageal lead, and the lower is V_1 , which is simultaneously recorded.

of larger amplitude and the Q wave of smaller amplitude as the higher levels were reached, so that the pattern actually changed from qR to QR in appearance. The T wave was upright to diphasic at lower levels and inverted at higher levels.

Intracardiac electrocardiograms (fig. 7 A, B and C) were obtained with the electrode within the great vessels and cardiac chambers. In the right pulmonary artery and main pulmonary artery, the ventricular complex was QR in configuration. In the right ventricle in the region of the pulmonary valve, the pattern was rS in configuration with the R wave

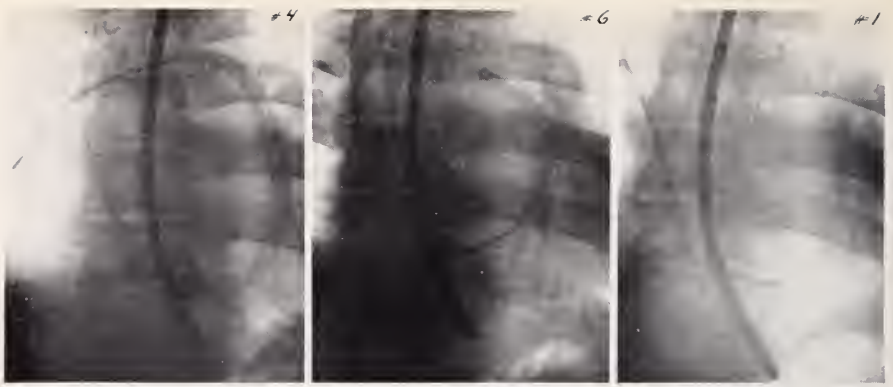


FIG. 7. A. 378: Spot films of esophageal and intracardiac electrodes. In film 4, catheter tip is in the right pulmonary artery; in film 6, in the main pulmonary artery above the pulmonic valve; in film 1; in the bottom of the right atrium.

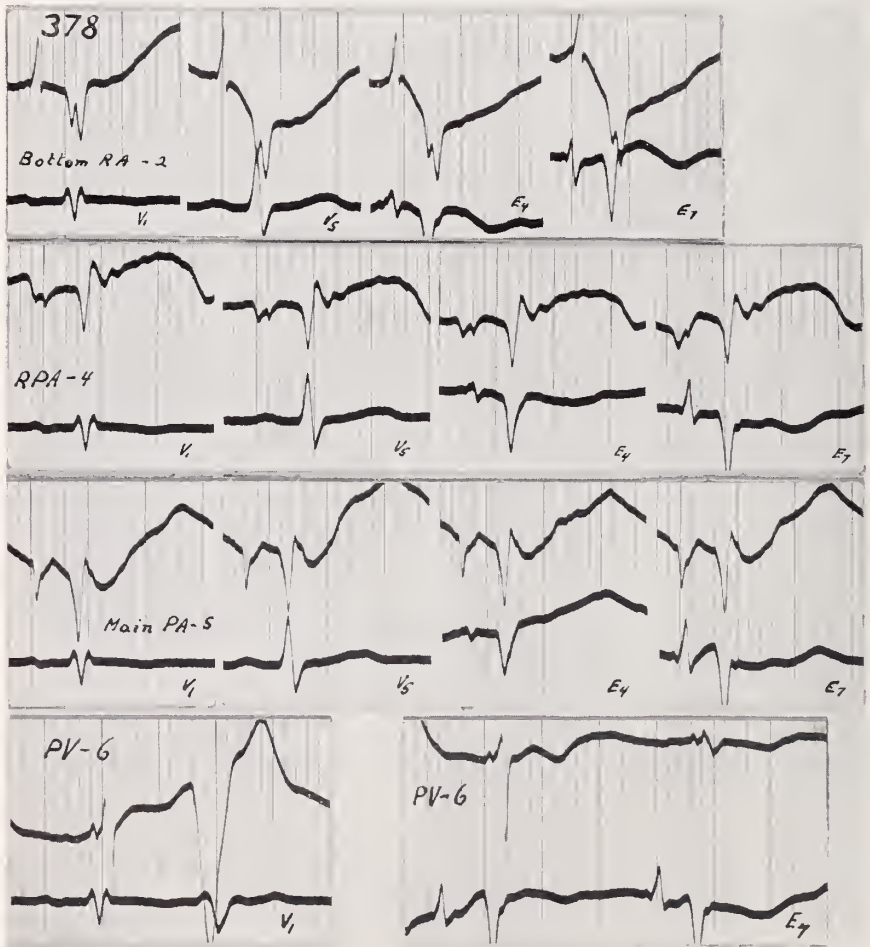


FIG. 7. B. 378: Intracardiac leads. See text for details. The upper tracing in each record is the intracardiac lead. Each intracardiac lead has been recorded simultaneously with the lower tracings which have been labelled. (Linn.V.: left innominate vein; MCL: mid-clavicular line; L.ax.v.: left axillary vein; L.brach.v.: left brachial vein).

in succeeding complexes being variously notched or slurred, and varying in amplitude. The S wave varied considerably in amplitude in this region.

In the tricuspid valve region, both in the right ventricle and lower right atrium, the ventricular pattern was rS in configuration. In mid right atrium, the configuration became QR, with a prominent notch registered on the ascending limb of the Q wave. In the posterior

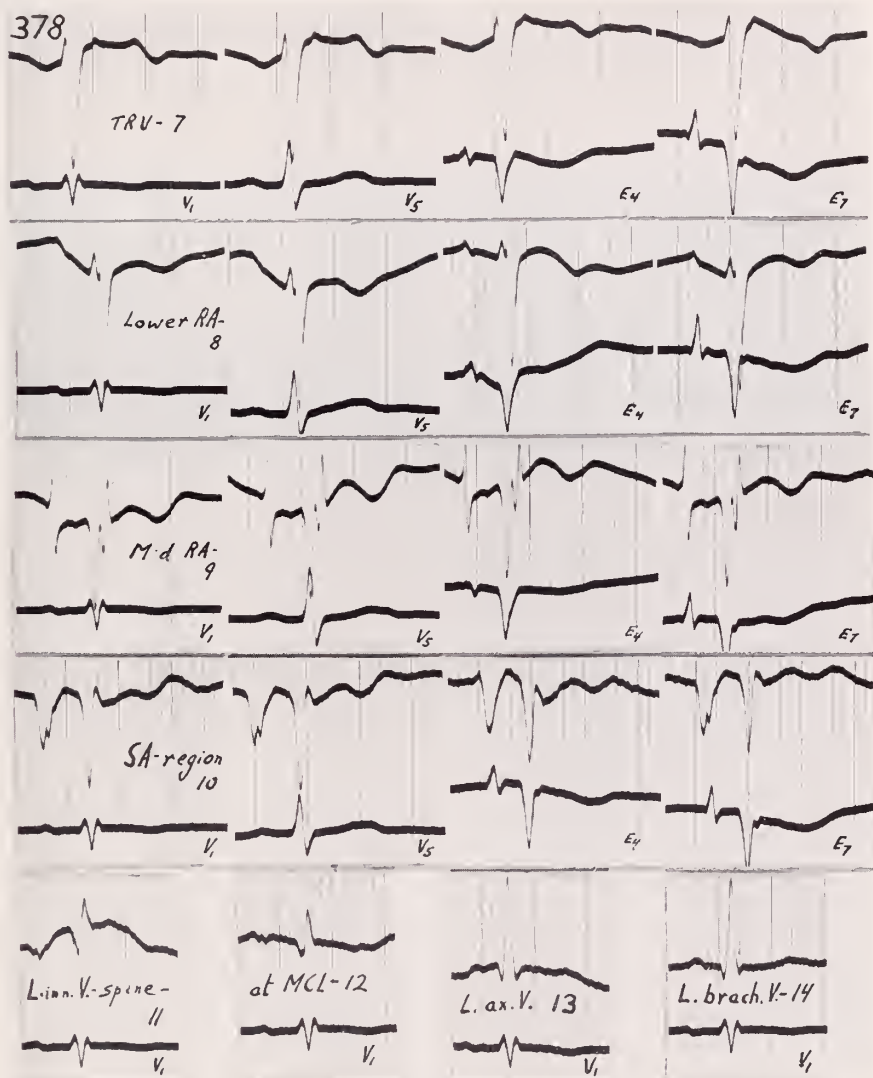


FIG. 7C

pocket of the right atrium, a QS pattern was recorded. In the region of the sinus node, the pattern was Qr, and as the catheter was withdrawn into the superior vena cava, the pattern became QR in configuration, and then qR in the left innominate vein. Due to respiratory interference, the contour of the T waves could not be clearly distinguished.

The horizontal plane projection of the spatial vectorcardiogram (fig. 8) was characterized

by the initial inscription of the QRS sĒ loop to the right and anteriorly, followed by a return to the left in a counter-clockwise direction. The terminal portion of the loop was then inscribed anteriorly and to the right, having the appearance of a terminal appendage. It was partially inscribed over the T sĒ loop. In the sagittal projection, the initial portion of the QRS sĒ loop was inscribed inferiorly and anteriorly. The loop was then inscribed superiorly and in a clockwise direction, with the return limb directed anteriorly and corresponding to part of the appendage noted in the horizontal projection. In the frontal projection, the loop was inscribed in a counter-clockwise direction, having an initial small deflection to the right. The terminal portion is again somewhat obscured by the T sĒ loop, but projects towards the observer (i.e. anteriorly) and somewhat to the right as a comparison with the other projections reveals.



FIG. 8. VCG 378: See text for details

The axis of the T sĒ loop is oriented in essentially the same anterior posterior plane as the QRS sĒ loop, but to its left and inferiorly.

CORRELATION

A. *Conventional electrocardiograms:* The initial slight deviation of the QRS sĒ loop to the right as visualized in the frontal plane inscribes a small Q wave in lead I, while the deflection inferiorly inscribes the R wave in leads II and III. The S waves in leads II and III are inscribed as the loop is directed to the negative side of these bipolar leads. There is an inverted T wave in lead III since the projection of the T sĒ loop is on the negative side of lead III. In VR the terminal R wave of low amplitude but of fairly long duration is inscribed by the terminal R wave of low amplitude but of fairly long duration is inscribed by the terminal appendage which is to the right. Further details of standard leads I, II and III and of VR, VL, and VF can be derived by reference to the triaxial system of Bayley. The similarity of lead I to lead A, and of VF to C is apparent.

The configuration of the multiple thoracic leads derived from the horizontal projection corresponds quite well to the recorded patterns when the axes of derivation are imposed upon this projection. The interesting feature is the terminal appendage of the QRS sĒ loop. Its projection onto the proximal portions of the axes of derivations of VR₇, VR₅, VR₃, and V₁ inscribes the terminal R wave in these scalar electrocardiograms. The terminal slow S wave in V₆ is due to the projection of the terminal appendage onto the distal portion of the axis of derivation of this lead.

B. *Esophageal leads:* When the axes of derivation of the esophageal leads are superimposed upon the sagittal plane projection, the scalar electrocardiograms so derived correlate very closely with those recorded with the electrodes within the esophagus. The initial deflection anteriorly and inferiorly inscribes the R wave present in E₁ and VF, while the superior deflection inscribes an S wave. At the levels of E₅-E₆, the entire QRS sĒ loop is projected upon the distal or negative side of the axes of derivation of these leads, so that a QS pattern is recorded. The projection of the initial portion of the loop remains upon the

negative side of the axis of derivation of each esophageal lead from E_3 to E_{15} , and inscribes the initial Q wave in these leads. The slurred and notched S wave in E_2 to E_6 is attributed to the terminal appendage which lies anteriorly and to the right. The projection of the portion of the QRS sE loop, which is superior to E, onto the proximal portion of the axis of derivation of leads E_7 to E_{15} inscribes an R wave in these leads. As the projection increases in size, the R wave increases in amplitude.

The orientation of the T sE loop anteriorly and inferiorly inscribes an upright T wave only in inferior esophageal leads, and an inverted T wave in esophageal leads lying somewhat posterior or at all superior to E.

C. Intracardiac and great vessel leads: The configurations of VL and of the electrocardiogram obtained within the left innominate vein were essentially similar indicating that VL and the lead within the innominate vein were located along the same axis of derivation.

The QRS complex varied considerably in configuration in this case, even within the same chamber, and at fairly close regions within the same chamber. It is to be recalled that a large portion of the QRS sE loop is inscribed superiorly and anteriorly as compared to E, and that the terminal portion particularly extends anteriorly and to the right. Hence, an exploring electrode located superior to E will record a terminal R wave, and an initial Q wave, the latter inscribed by the initial deflection of the QRS sE loop inferiorly. This pattern will be obtained unless the electrode lies directly posterior to E. Qr or QR pattern were obtained within the main pulmonary artery which lies above E. The electrode within the right pulmonary artery lies to the right of E and far posteriorly. In this position, a QR complex is also to be expected since the initial deflection is anterior and inferior. The terminal portion of the QRS sE loop is sufficiently superior to E that it will project as a positive deflection for many degrees to the right of E, and to a lesser degree to the left, as long as the exploring electrode is also superior to E.

Similarly, in the high and mid-portion of the right atrium, the electrode is to the right of the terminal appendage and at a high enough level in regard to E that this portion of the QRS sE loop is projected as a terminal positivity, or R wave. Since the initial portion of the QRS sE loop is directed to the right inferiorly, and anteriorly in any location within the right atrium at which the exploring electrode lies sufficiently posterior or superior, an initial Q wave will be inscribed. As the electrode is moved anteriorly and inferiorly, as in the low right atrium near the tricuspid valve, the electrode will lie more inferiorly and somewhat more anteriorly so that an initial R wave is inscribed in the scalar electrocardiogram. In this location, the terminal portion of the QRS loop no longer projects upon the proximal or positive portion of the axis of derivation of such a lead, since the electrode lies too far inferiorly. Hence, a terminal large S wave is inscribed so that the pattern on either side of the tricuspid valve is rS in configuration. In the posterior pocket of the right atrium the pattern was QS in configuration, which is the configuration anticipated in any lead lying posterior to E as in the esophageal leads which were recorded along essentially the same axes of derivation. All of the different patterns obtained within the right atrium are thus readily analyzed if one considers an electrode, as it occupies the different positions in space described, in relationship to the spatial vectorcardiogram recorded. If markedly posterior, a QS pattern is obtained; if superior, Qr; and if inferior and more anterior, rS. All of these spatial relationships can be obtained within the right atrium, if one assumes that E is located high in the region of the interventricular septum and in an anterior position.

Within the right ventricle in the region of the pulmonary valve, an initial R wave is inscribed as the initial portion of the QRS sE loop is inscribed inferiorly, and the electrode lies to the right and inferiorly of E as compared to the position of the electrode in the main pulmonary artery. Similarly, a terminal S wave is inscribed by the superior orientation of the terminal portion of the QRS sE loop. The variation in the notch of the R wave, and the depth of the S wave from complex to complex is readily understood if one moves a straight edge at varying degrees in relationship to the sagittal plane projection of the QRS sE loop, with the axis of derivation lying anterior to E and at an angle of zero degrees. Slight move-

ment of the axis superiorly or inferiorly will vary the configuration of the derived QRS complex, so that the pattern derived corresponds quite closely to that recorded within the right ventricle.

DISCUSSION

The activation of the heart is accompanied by the production of electromotive forces which can be represented at any one instant by a vector depicting the spatial orientation and magnitude of this force (1, 2). During a cardiac cycle, the terminus of innumerable instantaneous vectors will describe a vector loop. By means of the cube form of representation, the configuration of this spatial vector loop is recorded as projected onto the horizontal, sagittal, and frontal planes (3). The configuration of any unipolar extremity or thoracic lead can be derived by the projection of the vector loop onto the line of axis between the recording electrode and the center of origin of the electromotive forces "E" (4, 9). An upright deflection (R wave) is inscribed when the loop is written on the proximal or positive side of "E", and a downward deflection (Q or S wave) when the loop is written on the distal or negative side of "E."

In the present investigation, a similar technique was employed for the derivation of electrocardiograms recorded by electrodes within the superior vena cava, right atrium, right ventricle, inferior vena cava, main pulmonary artery, and the right and left pulmonary arteries.

The derivation of these electrocardiographic patterns from the spatial vectorcardiograms necessitated the localization in space of the position of the recording exploring electrode, its relationship to the spatial vector loop and, hence, to E. The location of E differed somewhat from person to person. It is apparently not possible from the results of the present study to give E any precise anatomical site nor does such a localization seem necessary. It may well be that its location in the septal region varies even in the same person at different times of the cardiac cycle, especially when unbalanced potentials are present (10). Such minimal shift in the position of E should have little effect upon the configuration of distal leads.

There was very good correlation as to the timing and configuration of the recorded intracardiac leads in the present study, and those derived from the spatial vectorcardiogram in the wide variety of electrocardiograms analyzed.

Duchosal and Groscurin (10) have recorded electrocardiograms with electrodes placed within the superior vena cava, right atrium and inferior vena cava in three patients. They compared the patterns thus obtained with those derived from the frontal plane projection of the spatial vectorcardiogram. The differences were in each instance insignificant. They concluded that "such comparisons tend to demonstrate that the potential recorded at any point of the body (the right atrial cavity included) seated outside of the ventricular walls or valves is conditioned by the instantaneous dipole representing the summation of all electromotive forces produced by the myocardial units activated at the same moment." In their analyses, E occupied a different position in each patient, and the position of the electrode was localized on the frontal plane although they stated that, in a few instances, the line of the lead was probably not entirely parallel to the

frontal plane. A comparison of intraventricular leads was not attempted. They mentioned the possibility that the center dipole might be momentarily displaced in such lesions as bundle branch block or infarction, where there is temporary loss of the balance of electromotive forces.

Duchosal and Sulzer (9) described the electrocardiogram obtained within the right atrium in one patient, and compared the patterns recorded with that derived from the frontal plane. In the same patient an electrode was introduced into the left atrium, and the pattern so obtained was compared with that derived from the constructed model, with the lead on the assumed axis of derivation. Good correlation was found in their two records. They concluded that no special distinction is to be made between precordial or endo-atrial leads as far as the electrical field of the ventricular current of action was concerned. They also derived esophageal leads from constructed models of a spatial vectorcardiogram in one patient and again found good correlation.

There have been several electrocardiographic studies published which were based upon catheterization of the great vessels and chambers of the heart in normal and abnormal conditions (11-22).

Many of the records so obtained revealed a significant variation in the ventricular patterns within the same cardiac chamber in the same individual. Movements of the recording electrode within the explored atrial or ventricular chamber, as with respiration, resulted in altered ventricular complexes. Investigations of pathological conditions have resulted in conflicting reports as to the intracavity potentials found in various conduction defects and hypertrophy.

The analysis of intracardiac patterns, which can be bizarre in configuration, is often difficult if not impossible when based upon the principles of localized potentials and contributions due to variously situated hypertrophied muscle bundles. Electrocardiographic exploration of the coronary veins has also revealed a variety of QRS and T wave complexes (23) the contours of which have been explained on the basis of contiguity of the electrode to accessible left atrial and ventricular cavity and epicardial potentials. Similarly, the patterns obtained on catheterization of the aorta, inferior vena cava, superior vena cava, and pulmonary arteries are often complex and difficult to interpret by conventional standards of localized potential contributions. However, there have been important similarities noted between the configuration of potentials recorded in the superior vena cava as compared to AVR, in the inferior vena cava as compared to AVF, and in the left subclavian vein as compared to AVL.

The electrocardiographic patterns obtained with the exploring electrode occupying various positions within the heart and great vessels are probably best explained on the basis of vector analysis, rather than localized potentials. With this concept as the basis of intracardiac interpretation, the exploring electrode can be considered as recording the electromotive field force as it exists at any one point. The main orientation to be determined is that of the electrode to the electromotive center, "E", of the heart, rather than to specific myocardial elements. Significant variations in potentials within the same chamber are not unexpected as the orientation of the electrode to E varies. This is especially

true of dilated chambers since, in such instances, the axis of derivation of the exploring electrode may occupy markedly different spatial positions. Minimal or occasionally marked differences may be expected as the exploring electrode is variously located in respect to E. It is thus not altogether correct to speak of a single right ventricular or right atrial cavity potential.

The frequent resemblance of an extremity potential to that recorded in the great vessels is to be anticipated since the exploring electrode within the great vessels is often on the same line of derivation as is the particular extremity electrode. Whether or not the recorded extremity pattern is similar to that obtained within certain cardiac cavities or over certain cardiac chambers is a matter of relative unimportance and often a matter of coincidence. It is the orientation in space of the exploring electrode to the total electromotive field forces of the heart which determines the pattern obtained, not anatomic contiguity.

These limitations in no way minimize the value of certain facts obtained only from intracardiac studies, such as those concerning bundle branch block. Since in left bundle branch block, for example, there is an altered spread of the wave of accession through the septum, deviations from the normal are to be expected in the orientation of the electromotive forces which are the resultant of this activation. Intracardiac electrodes, particularly when placed on each side of the intraventricular septum, can record the direction of the initial invasion. Thus, it is usually agreed upon, that in normal conduction, the essential findings are initial positivity within the right ventricular cavity, and initial negativity within the left ventricular cavity. In left bundle branch block, however, the left ventricular cavity is initially positive. It is on the basis of intracardiac leads in both animals and man that it is thus possible to diagnose the minimal degrees of left bundle branch block (13, 20). The wave of accession in left bundle branch block apparently spreads through the septum as a broad wave front from right to left in an essentially posterior and superior direction. In left bundle branch block, the vectorcardiogram in the horizontal plane is thus inscribed in a clockwise rather than in a counter-clockwise direction (24).

In several previous reports, a close correlation was indicated between the esophageal patterns recorded by multiple electrodes and those derived from the sagittal projection of the spatial vectorcardiogram (4, 6). The correlation was found in a wide variety of both normal and abnormal electrocardiographic patterns. The recording of QS or Qr deflections at left atrial level in normal persons can be ascribed to the fact that the QRS $s\hat{E}$ loop is oriented essentially downwards. The Qr and QS patterns at left atrial level reflect essentially the same pattern recorded in the left ventricular cavity. In both instances, the recording electrodes are so oriented that they face the negative side of the dipole throughout most of the wave of accession and thus record the negative projection of each instantaneous vector. It may be preferable to replace the concept of cavity leads as applied to esophageal leads at certain levels with the concept of leads facing the negative side of the dipole without necessarily implying their anatomical relationship.

In such abnormal electrocardiographic patterns as left ventricular hypertrophy

(25) and left bundle branch block (26), the esophageal leads at left atrial level were found to correspond quite closely with those reported in the human left ventricular cavity as to the configuration of the QRS complex, RS-T segment, and T wave (20, 21). Thus, esophageal leads at this level are apparently located along essentially the same axis of derivation as is a lead within the left ventricular cavity.

There still remains to be determined what relationship exists between direct cardiac leads and the spatial vectorcardiogram. Preliminary observations by other investigators indicate that there may be minimal differences between the scalar direct electrocardiogram and leads recorded away from the heart. Such differences disappeared when the exploring electrode was removed 1–2 mm. away from the heart of a frog or turtle (27).

The spatial vectorcardiogram represents the sum total of all electromotive forces contributed by the heart. At even minimal distances from the heart, an exploring unipolar electrode thus records the total electromotive forces as represented at that one point. An electrode on the right precordium no more records the localized potentials of the right ventricle, than an electrode over the left precordium records the localized potentials of the left ventricle. The patterns obtained in these positions, rS and qR respectively, are certainly not specific for any particular chamber. Such analyses fail to consider that V_1 and V_2 are more apt to be contiguous to the right atrium than to the right ventricle, as has been shown by angiocardiographic studies (28). On both sides of the precordium the total electromotive forces of the heart are recorded as projected to the explored site. Electrodes on opposite sides of "E", therefore, record complexes of mirror image configuration when compared with each other.

Electrodes within the great vessels or cardiac chambers may also be considered as recording the total resultant electromotive forces as projected to the spatial point explored. From the spatial vectorcardiogram and the known spatial position of the exploring electrode, the scalar electrocardiogram at that point can be determined. There is apparently no fundamental difference between intracardiac and remote electrocardiography. It is interesting to note that in 1920, G. Fahr stated: "It is only by following the change in direction and magnitude of the resultant potential difference, combined with our knowledge of the architecture of the specific conducting system, that we can analyze the path of the spread in the human ventricle. . . . We desire to impress the reader with the fact that it is impossible to determine anything other than the magnitude and direction of this resultant vector of potential difference from the deflections of the galvanometers both in these simple cases and in the more complicated case of the distribution of electronegativity in the human heart immersed in the conducting substances of the human body (29)."

SUMMARY

1. Intracardiac leads and spatial vectorcardiograms were recorded in 9 persons. Multiple esophageal leads were recorded in 5 of these cases.
2. There was good correlation of the recorded electrocardiograms and those

derived from the determined spatial orientation of the electrode within the great vessels, right atrium, right ventricle, and esophagus.

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THE CAUSES OF DEATH AFTER OPERATION*

A COMPARISON BETWEEN THE LAST DECADE AND THE 1920s

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In the 1920s, postoperative pneumonia assumed considerable importance not only as a clinical entity but also as a cause of postoperative mortality. At that time, we analyzed a series of 800 postmortem examinations performed upon patients who had died after surgical procedures. That series embraced data obtained at The Mount Sinai, Presbyterian, and Bellevue Hospitals. The result of that analysis was published in the *Annals of Surgery*, in March of 1930. It showed that suppuration connected with the operative procedure was the outstanding primary cause of death after operation and that postoperative pneumonia was the sole cause of death in only eight per cent of the postmortem material.

Nearly twenty years have passed since the original results were compiled, and great advances have been made in the art of surgery. We now believe that it is of interest to repeat our investigation and again analyze a series of postmortem examinations performed upon patients who died after operation during the chemotherapeutic and early antibiotic eras.

All of the postmortem examinations performed upon patients who died postoperatively at The Mount Sinai Hospital from 1938 to 1947, inclusive, were reviewed. This encompassed the sulfonamide period beginning with the year 1938 and the penicillin period starting in 1945. The analysis was conducted in the same manner as in the first investigation so that a fair comparison could be made.

We wish to emphasize that this analysis is in no way related to operative mortality, but is solely concerned with the question of why patients die after operation.

It is to be noted (table 1) that during the decade from 1938 to 1947 there has been a gradual decrease in the number of post mortems to include in our series. In 1947, there were only 41 cases as compared with 107 in 1938. This is undoubtedly due to a decrease in operative mortality because the percentage of post mortems obtained during this period has remained fairly constant (table 1), while the number of operations performed in the Hospital has increased. Furthermore, the average percentage of post mortems obtained (44%)¹ is sufficient to give an accurate picture of the entire problem of postoperative deaths.

As in the first analysis, the post mortem examinations of all patients dying within 48 hours after operation were excluded. These were mainly deaths due to shock and hemorrhage, and of patients operated upon in a serious or possibly moribund condition. In most of these cases, it is difficult to determine accurately the cause of death in relation to the operative procedure. All postmortem exami-

* From the Laboratories of The Mount Sinai Hospital, Division of Pathology.

¹ The percentage of post mortem examinations obtained upon surgical patients is not available. The figures used are for all Hospital deaths and post mortems.

nations which were not sufficiently complete for the establishment of a definite cause of death were also omitted. Deaths after readmission, as well as those occurring after transfer to the medical service, were also excluded. All patients remaining on the surgical service were included, regardless of how long post-operatively death occurred.

In the post mortem protocol at The Mount Sinai Hospital, it is customary for the pathologist performing the examination to list a "Cause or Causes of Death" at the end of the report. These causes of death have been utilized in compiling these statistics. We believe that this lessens to a great degree the possibility of human error in interpreting a typewritten report. The individual performing the examination can best weigh the relative importance of the findings at the time

TABLE 1
Hospital statistics†

YEAR	HOSPITAL OPERATIONS	CASES IN THIS SERIES	TOTAL DEATHS IN HOSPITAL	TOTAL POST MORTEMS	PER CENT POST MORTEMS OBTAINED
1938	*	107	808	400	50
1939	*	91	799	344	43
1940	9538	89	733	341	47
1941	9831	79	735	328	45
1942	10321	75	706	326	46
1943	10513	70	810	323	40
1944	10238	65	750	321	43
1945	9930	51	688	281	41
1946	9822	41	679	273	40
1947	9956	41	659	296	45

* Not available.

† Surgical statistics are not kept separately, therefore, total Hospital deaths and post mortems have been used.

of observation. In a small number of cases, however, where no cause of death was stated, we have classified the cause after careful analysis of the protocol.

We have used the same categories for causes of death as in the first analysis. They are as follows:

1. The Original Disease: If any infection was found at the time of operation and the death was due to a progression of this infection, the case was placed in this category.
2. Suppuration: If suppuration occurred in patients in whom there was *no* infection at the time of operation, but where the post mortem examination revealed recent infection related to the operative field.
3. Suppuration plus a Systemic Disease: If a severe systemic disease, such as generalized arteriosclerosis, chronic myocarditis, or renal disease, was found in conjunction with a localized suppurative process.
4. Suppuration plus Pneumonia: If both pathologic conditions were present and both were thought to be important factors in causing death.
5. Pneumonia.

6. Pneumonia plus Systemic Disease: The presence of a severe systemic disease, as in Group 3, in a patient dying from terminal bronchopneumonia would place the case in this category.

7. Miscellaneous Causes. (Listed separately in table 1.)

The tables have been made to conform to those in the previous paper and, wherever possible, the results of the first analysis have been incorporated for comparison. In all the tables, the cases have been divided into those patients who received chemo- and/or antibiotic therapy and those who received none. Table 2 shows the percentage of patients who received such therapy in each year.

TABLE 2
Cases receiving chemo-and/or antibiotic therapy

YEAR	TOTAL CASES	RECEIVED THERAPY	PER CENT
1938	107	17	16*
1939	91	29	32*
1940	89	45	49*
1941	79	31	39*
1942	75	30	40*
1943	70	33	47*
1944	65	41	63*
1945	51	36	71†
1946	41	39	95‡
1947	41	40	97§
Total	709	341	48

* Received only sulfonamides.

† 17 received only sulfonamides, 11 received only penicillin, 7 received penicillin and sulfonamides, 1 received penicillin, sulfonamides, and streptomycin.

‡ 20 received only penicillin, 3 received only sulfonamides, 14 received penicillin and sulfonamides, 1 received penicillin and streptomycin, 1 received penicillin, sulfonamides and streptomycin.

§ 23 received only penicillin, 12 received penicillin and sulfonamides, 2 received penicillin and streptomycin, 3 received penicillin, sulfonamides, and streptomycin.

The chemotherapeutic agents used were the various sulfonamides which were given in the manner and dosage common to the various techniques prevailing during the years reviewed. Penicillin was the main antibiotic used. Only five patients received streptomycin.

In the early days of chemotherapy and antibiotic therapy, the required doses for adequate therapeutics were not clearly defined. No case was considered to have received such therapy unless it had been administered in what is now considered to be adequate amounts. Furthermore, if a patient only received these drugs for a day or two before death (usually after infection had been discovered), the case was placed in the *no* therapy group. We wish to emphasize that in respect to both the chemotherapy and the penicillin administered, whenever there was a doubt as to the full dosage of the drug, such cases were placed in the *no* therapy group.

Attention is also called to the fact that the two groups (those that received antibacterial therapy and those that received none) were in no measure control groups. It is only by chance that approximately fifty per cent of the cases fell into each group. From table 2, it is evident that the great variation in the percentage of those receiving chemo- and/or antibiotic therapy in various years precludes any possibility of using the one group as a control. Furthermore, although all patients were gravely ill, it is most likely that antibacterial therapy was given to those who were either considered to be most seriously ill or in whom suppuration or pneumonia was suspected or discovered early in the postoperative course.

As in the study made in 1930, various large groups of cases have been analyzed separately merely because they comprise a number sufficient to warrant such analysis. They are: operations on the (1) gastrointestinal tract, excluding transthoracic operations and appendectomies; (2) genitourinary tract; (3) liver, gall bladder, bile ducts, and pancreas; (4) exploratory laparotomies; and (5) a group which had no counterpart in the earlier analysis, namely, thoracic operations, including transthoracic operations upon the oesophagus and stomach.

Table 3 shows the causes of death in the entire series of 709 cases as compared with the 800 cases before 1930. It reveals a reduction in death from the original disease from 42 per cent to 34 per cent, an increase in deaths from pneumonia from 8 per cent to 11 per cent, and an increase in miscellaneous causes from 15.5 per cent to 23 per cent. Despite the administration of chemo- and/or antibiotic therapy in adequate doses to 48 per cent of the cases in the present series the percentage of deaths from suppuration occurring after operation remained practically the same.

The decrease in deaths from the original disease occurs almost entirely in the suppurative group (table 5); in fact, there was an increase of 1 per cent in such deaths in the nonsuppurative group (table 4). It should be stated here that those cases in which gross pus, purulent material, or fluids with positive bacteriologic culture was present at operation were classified as suppurative. When a patient in this classification died from suppuration, the mortality was considered as one due to the original disease.

The increase of 3 per cent in deaths from pneumonia may be due in part to the increased number of thoracic cases in this series. There were 101 thoracic operations (including 10 exploratory thoracotomies) in this series, with a mortality of 15 per cent from pneumonia. In the remaining 608 cases the mortality from pneumonia was only 10.2 per cent, but this was still 2.2 per cent greater than the earlier series.

The remarkable similarity in the causes of death of patients who received chemo- and/or antibiotic therapy and those who did not is to be noted. There was a slight difference in two categories: of the patients receiving therapy, 32 per cent died from their original disease as compared with 36 per cent of those who received no therapy and 25 per cent died from suppuration in the treated group as compared with 21 per cent in the untreated group. This paradoxical finding will be discussed later. The marked increase in the number of deaths

from pulmonary embolism in the miscellaneous category is of significance. In fact, the number (58 or 8.2 per cent) is sufficient to warrant a separate classi-

TABLE 3
Causes of death

	800 CASES BEFORE 1930		709 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTI- BIOTICS 48%		RECEIVED NO CHEMOTHERAPY OR ANTI- BIOTICS 52%	
	No.	%	No.	%	No.	%	No.	%
Original disease	336	42.0	240	34.0	108	32.0	132	36.0
Suppuration	204	25.5	162	23.0	85	25.0	77	21.0
Suppuration plus systemic dis- ease	12	1.5	18	2.0	8	2.0	10	3.0
Suppuration plus pneumonia	32	4.0	29	4.0	13	4.0	16	4.0
Pneumonia	62	8.0	77	11.0	38	11.0	39	11.0
Pneumonia plus systemic dis- ease	28	3.5	22	3.0	10	3.0	12	3.0
Miscellaneous	126	15.5	161	23.0	79	23.0	82	22.0
Total	800	100.0	709	100.0	341	100.0	368	100.0

*Miscellaneous causes
before 1930*

Cardiac disease and ar- teriosclerosis	34
Embolism and throm- bosis	25
Ileus (non-perito- nitic)	23
Hemorrhage	16
Renal disease	9
Pulmonary tuberculo- sis	8
Duodenal fistula	4
Acute yellow atrophy	2
Pulmonary atelecta- sis	1
Ruptured urinary blad- der*	1
Acute appendicitis*	1
Acute pancreatitis*	1
Tetanus	1

126

*Miscellaneous causes
1938-1947*

Pulmonary embolism	58	Air embolism	1
Cardiac failure	33	Ileus (non-peritonitic)	1
Coronary occlusion	11	Lung abscess*	1
Hemorrhage	8	Perforation of colon*	1
Cerebral accident	6	Duodenal leak	1
Intestinal obstruc- tion	6	Uremia	1
Hepatic insufficiency	4	Pyelonephritis	1
Atelectasis	4	Tuberculosis of adre- nals	1
Hemoglobinuric ne- phrosis	4	Mastoid sepsis*	1
Bleeding peptic ulcer*	3	Perforated ulcer*	1
Renal disease*	3	Suicide	1
Pulmonary oedema	2	Perforated aneurysm*	1
Shock	2		—
Perforated gall blad- der*	2		161
Infarcted intestine*	2		
Pancreatic necrosis*	1		

* Unassociated with original disease.

fication. In the first series, deaths from embolism and thrombosis were grouped together and only totaled 25 (3 per cent). This increase in deaths from pulmonary embolism is all the more interesting because only in the last decade has the

importance of phlebothrombosis and its relation to embolism been appreciated. Furthermore, during the last few years covered by this analysis, vigorous efforts were made to prevent the occurrence of phlebothrombosis. Once its presence was diagnosed, vein ligation and anticoagulant therapy was practiced upon some of the surgical patients. Table 6 shows the number of deaths from pulmonary

TABLE 4
Non-suppurative cases

CAUSES OF DEATH	521 CASES BEFORE 1930		511 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTI- BIOTICS 47%		RECEIVED <i>no</i> CHEMOTHERAPY OR ANTI- BIOTICS 53%	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	89	17.0	91	18.0	30	13.0	61	22.0
Suppuration.....	204	39.0	162	31.0	85	36.0	77	28.0
Suppuration plus systemic disease.....	12	3.0	11	2.0	7	3.0	4	2.0
Suppuration plus pneumonia.....	22	4.0	25	5.0	11	5.0	14	5.0
Pneumonia.....	57	11.0	66	13.0	33	14.0	33	12.0
Pneumonia plus systemic disease.....	27	5.0	19	4.0	8	3.0	11	4.0
Miscellaneous.....	110	21.0	137	27.0	65	26.0	72	27.0
Total.....	521		511		239		272	

TABLE 5
Suppurative cases

CAUSES OF DEATH	279 CASES BEFORE 1930		198 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 51%		RECEIVED <i>no</i> CHEMOTHERAPY OR ANTIBIOTICS 49%	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	247	88.5	149	75.0	78	76.0	71	74.0
Suppuration.....								
Suppuration plus systemic disease.....	0		7	4.0	1	1.0	6	6.0
Suppuration plus pneumonia.....	10	3.5	4	2.0	2	2.0	2	2.0
Pneumonia.....	5	1.5	11	5.0	5	5.0	6	6.0
Pneumonia plus systemic disease.....	1	.5	3	2.0	2	2.0	1	1.0
Miscellaneous.....	16	6.0	24	12.0	14	14.0	10	11.0
Total.....	279		198		102		96	

embolism occurring in each year. In the last two years, 1946 and 1947, 9.7 per cent of the postmortem examinations disclosed that pulmonary embolism was the cause of death.

Table 4 comprises the cases in which no suppuration was present at the time of operation. The main differences between this group and the comparable one in the first series are a reduction of 8 per cent in deaths from postoperative suppuration and an increase of 6 per cent in deaths from miscellaneous causes,

in great part made up of an increase in the number of pulmonary embolisms. One would like to ascribe this reduction of 8 per cent in deaths from suppuration to the advent of chemo- and/or antibiotic therapy, but we find a reduction of 11 per cent in deaths from suppuration in the untreated cases in the present series as compared with the first series. This reduction must, therefore, be ascribed to the improvement in the art of surgery. In the treated group, we find the deaths from suppuration 8 per cent higher than in the untreated group and only 3 per cent less than in the series before 1930. This paradoxical finding is probably due to the fact that chemo- and/or antibiotic therapy was given in greater frequency when postoperative infection was anticipated or suspected early in the postoperative course.

TABLE 6
Pulmonary embolism

YEAR	POST MORTEM	PULMONARY EMBOLISM	PER CENT
1938	107	6	5.6
1939	91	6	6.6
1940	89	5	5.6
1941	79	10	12.6
1942	75	8	10.6
1943	70	3	4.3
1944	65	11	16.9
1945	51	1	1.9
1946	41	4	9.7
1947	41	4	9.7
Total	709	58	8.2

The reduction in the percentage of those who died from their original infection (table 5) is not necessarily evidence of an effect produced by the introduction of chemo- and/or antibiotic therapy, for in this table, we also see that the same percentage of patients died from their original infection whether or not they received therapy. Once again we wish to reiterate that we are analyzing postmortem examinations and are in no way concerned with the patients who survived operations for suppuration with the aid of the sulfonamides and penicillin.

An analysis of the non-suppurative gastrointestinal cases (table 7) shows that the percentage of deaths from postoperative suppuration is practically the same in both series and also whether or not chemo- and/or antibiotic therapy was given. This may be explained by the fact that although the technique of intestinal surgery has progressed since the 1920s, and postoperative mortality has been greatly reduced, the main cause of postoperative peritonitis can usually be attributed to a dehiscence at an anastomotic area. When this complication ensues, the administration of antibiotic therapy will probably have little influence upon the final outcome.

In table 8, the comparison of the intestinal cases in which suppuration was present at the time of operation shows a considerable decrease in deaths from the original suppuration. This was due not only to the use of chemo- and/or

TABLE 7
Gastrointestinal cases non-suppurative
(Excluding transthoracic operations and appendectomies)

CAUSES OF DEATH	246 CASES BEFORE 1930		224 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 56%		RECEIVED no CHEMOTHERAPY OR ANTIBIOTICS 44%	
	No.	%	No.	%	No.	%	No.	%
Original disease	28	11.0	26	12.0	11	9.0	15	15.0
Suppuration	109	45.0	100	45.0	57	46.0	43	43.0
Suppuration plus systemic disease	9	4.0	6	3.0	5	4.0	1	1.0
Suppuration plus pneumonia	15	6.0	11	4.0	8	6.0	3	3.0
Pneumonia	30	12.0	27	12.0	14	11.0	13	13.0
Pneumonia plus systemic disease	16	6.0	6	3.0	2	2.0	4	4.0
Miscellaneous	39	16.0	48	21.0	28	22.0	20	20.0
Total	246		224		125		99	

TABLE 8
Gastrointestinal cases suppurative
(Excluding transthoracic operations and appendectomies)

CAUSES OF DEATH	46 CASES BEFORE 1930		52 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 48%		RECEIVED no CHEMOTHERAPY OR ANTIBIOTICS 52%	
	No.	%	No.	%	No.	%	No.	%
Original disease	43	94.0	41	78.0	19	76.0	22	80.0
Suppuration								
Suppuration plus systemic disease	0		2	4.0	0		2	8.0
Suppuration plus pneumonia	2	4.0	1	2.0	1	4.0	0	
Pneumonia	0		4	8.0	3	12.0	1	4.0
Pneumonia plus systemic disease	1	2.0	0		0		0	
Miscellaneous	0		4	8.0	2	8.0	2	8.0
Total	46		52		25		27	

antibiotic therapy, as shown by the decrease which occurred in the untreated group as well as in the treated cases, but also to the use of better supportive therapy and more thorough methods of drainage.

In the postmortem examinations of patients dying after genitourinary operations, we find the greatest reduction in deaths from suppuration originating

postoperatively. That this cannot be ascribed entirely to antibacterial therapy is shown by the marked reduction which occurred in the cases which received no therapy (table 9). There was an appreciable increase in deaths from miscellaneous causes. This apparently always occurs when suppuration as a cause of death decreases.

TABLE 9
Genitourinary cases non-suppurative

CAUSES OF DEATH	55 CASES BEFORE 1930		67 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 39%		RECEIVED NO CHEMOTHERAPY OR ANTIBIOTICS 61%	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	5	9.0	13	19.0	5	19.0	8	19.0
Suppuration.....	24	44.0	13	19.0	7	27.0	6	15.0
Suppuration plus systemic disease....	0		3	5.0	1	4.0	2	5.0
Suppuration plus pneumonia.....	4	7.0	5	7.0	0		5	12.0
Pneumonia.....	10	18.0	5	7.0	1	4.0	4	10.0
Pneumonia plus systemic disease....	1	2.0	4	6.0	2	8.0	2	5.0
Miscellaneous.....	11	20.0	24	36.0	10	38.0	14	34.0
Total.....	55		67		26		41	

TABLE 10
Genitourinary cases suppurative

CAUSES OF DEATH	21 CASES BEFORE 1930		26 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 70%		RECEIVED NO CHEMOTHERAPY OR ANTIBIOTICS 30%	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	20	95.0	21	80.0	15	82.0	6	75.0
Suppuration.....								
Suppuration plus systemic disease....	0		2	8.0	1	6.0	1	12.5
Suppuration plus pneumonia.....	0		1	4.0	1	6.0	0	
Pneumonia.....	0		0		0		0	
Pneumonia plus systemic disease....	0		0		0		0	
Miscellaneous.....	1	5.0	2	8.0	1	6.0	1	12.5
Total.....	21		26		18		8	

The number of cases of liver, gall bladder, bile ducts, and pancreas operations is too small to warrant critical analysis. (tables 11 and 12). It is interesting to note the decrease in miscellaneous causes in this group—the only group which shows such a decrease. This may be explained by the fact that in the earlier series, 75 per cent of the miscellaneous causes of death in this group were hem-

orrhage, cardiac failure, and non-peritonitic ileus, and important innovations have since been made in the prevention and control of these complications.

Table 13, an analysis of the cases of exploratory laparotomy which came to postmortem examination, is included for the sake of completeness. The number

TABLE 11

Liver-gall bladder-bile ducts and pancreas cases non-suppurative

CAUSES OF DEATH	64 CASES BEFORE 1930		58 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 31%		RECEIVED NO CHEMOTHERAPY OR ANTIBIOTICS 69%	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	10	16.0	18	31.0	3	17.0	15	37.5
Suppuration.....	23	36.0	20	34.0	7	39.0	13	32.5
Suppuration plus systemic disease...	0		0		0		0	
Suppuration plus pneumonia.....	3	5.0	5	9.0	1	5.0	4	10.0
Pneumonia.....	5	8.0	3	5.0	2	11.0	1	2.5
Pneumonia plus systemic disease...	2	3.0	4	7.0	2	11.0	2	5.0
Miscellaneous.....	21	32.0	8	14.0	3	17.0	5	12.5
Total.....	64		58		18		40	

TABLE 12

Liver-gall bladder-bile ducts- and pancreas cases suppurative

CAUSES OF DEATH	27 CASES BEFORE 1930		20 CASES 1938-1947		RECEIVED CHEMOTHERAPY AND/OR ANTIBIOTICS 55%		RECEIVED NO CHEMOTHERAPY OR ANTIBIOTICS 45%	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	20	74.0	13	65.0	9	82.0	4	45.0
Suppuration.....								
Suppuration plus systemic disease...	0		0		0		0	
Suppuration plus pneumonia.....	2	7.0	1	5.0	0		1	11.0
Pneumonia.....	1	4.0	2	10.0	1	9.0	1	11.0
Pneumonia plus systemic disease...	0		1	5.0	0		1	11.0
Miscellaneous.....	4	15.0	3	15.0	1	9.0	2	22.0
Total.....	27		20		11		9	

(27) is too small to evaluate accurately and, furthermore, only 5 of these patients received therapy.

Transthoracic operations upon the stomach and oesophagus have been included in the thoracic group (table 14). These figures show similarity to the other groups. The one interesting feature is the smaller percentage of deaths from postoperative suppuration in the cases treated with chemo- and/or antibiotic therapy. On the other hand, this same group had a much larger percentage of

deaths from pneumonia. This would indicate, and it is evident clinically, that such therapy is especially efficacious in combatting pleural infection but has little effect upon suppurative bronchopneumonia, the type of pneumonitis which usually develops postoperatively.

TABLE 13
Exploratory laparotomies

CAUSES OF DEATH	NON-SUPPURATIVE				SUPPURATIVE			
	47 Cases before 1930		24 Cases 1938-1947		7 Cases before 1930		3 Cases 1938-1947	
	No.	%	No.	%	No.	%	No.	%
Original disease.....	26	55.0	11	46.0	6	86.0	3	100.0
Suppuration	10	21.0	5	21.0				
Suppuration plus systemic disease...	0		0		0		0	
Suppuration plus pneumonia.....	0		0		1	14.0	0	
Pneumonia	2	5.0	2	8.0	0		0	
Pneumonia plus systemic disease....	3	6.0	0		0		0	
Miscellaneous	6	13.0	6	25.0	0		0	
Total.....	47		24		7		3	

TABLE 14
Thoracic cases

(Excluding explorations but including transthoracic operations on oesophagus and stomach)

CAUSES OF DEATH	NON-SUPPURATIVE 56 CASES				SUPPURATIVE 35 CASES			
	Received Chemotherapy and/or Antibiotics 68%		Received no Chemotherapy or Antibiotics 32%		Received Chemotherapy and/or Antibiotics 37%		Received no Chemotherapy or Antibiotics 63%	
	No.	%	No.	%	No.	%	No.	%
Original disease....	2	5.0	1	5.5	9	70.0	19	86.0
Suppuration	9	21.0	8	45.0				
Suppuration plus systemic disease....	1	2.5	0		0		1	4.5
Suppuration plus pneumonia.....	1	2.5	1	5.5	0		0	
Pneumonia	10	26.0	1	5.5	0		1	4.5
Pneumonia plus systemic disease....	1	2.5	1	5.5	2	15.0	0	
Miscellaneous	14	37.0	6	33.0	2	15.0	1	4.5
Total.....	38		18		13		22	

In this series, there were 95 patients who received penicillin, with or without other antibacterial drugs. Table 15 shows the causes of death in this group, which comprises 71 per cent of the cases from 1945 through 1947. It is difficult to evaluate these figures because, as has been stated previously, this group is

undoubtedly heavily weighted with those patients in whom suppuration was severe and in whom a fatal issue was anticipated.

In any statistical analysis of a large number of cases, with their many inter-related factors, the interpretation of the figures may lead to errors. We have tried to avoid such errors by drawing only some general conclusions. We believe that, from the material at hand, our conclusions are justified.

TABLE 15
*Ninety-five cases receiving penicillin**

CAUSES OF DEATH	TOTAL CASES		NON-SUPPURATIVE CASES		SUPPURATIVE CASES	
	No.	%	No.	%	No.	%
Original disease.....	29	30.5	14	18.5	15	75
Suppuration.....	26	27.5	26	34.5	0	
Suppuration plus systemic disease.....	0		0		0	
Suppuration plus pneumonia.....	3	3.0	2	2.5	1	5
Pneumonia.....	7	7.5	6	8.0	1	5
Pneumonia plus systemic disease.....	2	2.0	2	2.5	0	
Miscellaneous.....	28	29.5	25	33.5	3	15
Total.....	95		75		20	

* Received only penicillin—54.

The remainder also received sulfonamides and streptomycin (table 2).

CONCLUSIONS

Mortality figures from all sides proclaim truthfully the remarkable reduction in postoperative mortality based on improvement in the art of surgery, scientific supportive therapy, and on the sulfonamides and antibiotic drugs. Nevertheless, the causes of death which existed twenty years ago exist today. They have been lost sight of because of the conspicuous decrease in the actual number of postoperative deaths.

Firstly, suppuration, whether present at operation or developing postoperatively still accounts for 44 per cent² of the deaths, despite the extraordinary efficacy of present day antibacterial agents. (In the first series, it accounted for 56 per cent of the deaths.) From our figures, we cannot state that the decrease in the percentage of deaths from suppuration has been due in any measure to these agents, for the decrease has also occurred in the untreated group.

Secondly, although chemotherapy and penicillin may have prevented or cured many postoperative pulmonary infections, this postoperative complication is a more common cause of death in this series than in the earlier one.

Thirdly, as suppuration has decreased as a cause of death, there has been an understandable concomitant increase in the percentage of deaths from miscel-

² In 162 patients, suppuration developed postoperatively; in 149, it was present at the time of operation.

laneous causes; but it is surprising that this increase has been almost entirely confined to deaths from pulmonary embolism.

SUMMARY

An analysis of 709 postmortem examinations performed upon patients dying after operations during the years 1938 to 1947, inclusive, has been compared with a similar series of 800 necropsies performed before 1930.

The causes of death in the two series are similar. There has been a reduction in the percentage of deaths due to suppuration, a slight increase in the percentage due to pneumonia, and a surprising increase in those due to pulmonary embolism.

VASOMOTOR RESPONSE IN HYSTERIA*

SAMUEL RICHARD ROSEN, M.D.

The cold pressor test has been in use since 1932 when Hines and Brown (1) found that cold could be used as a standard stimulus of blood pressure response. The test consists of a 1 minute immersion of the hand in ice water, average temperature 4° Centigrade to 6° Centigrade, during which period the blood pressure is recorded at the end of the first 30 seconds and the second 30 seconds. Prior to immersion the subject is kept at rest for 20 to 30 minutes until constant blood pressure readings are available. In testing 571 normal and hypertensive patients, 288 normals showed a mean rise of 11.4 mm. Hg systolic and 10.6 mm. Hg diastolic, 127 organic hypertensives with vascular changes in the optic fundi showed a mean rise of 47.2 and 34.3 mm. Hg respectively, while 66 hypertensives without vascular changes in the fundi showed a mean rise of 34.4 and 25.4 mm. Hg respectively (2) (3).

These findings have been supported by the work of Ayman and Goldshine (4), Yates and Wood (5), Briggs and Oerting (6). None of these investigators found an average rise in blood pressure of less than 9.7 mm. Hg systolic and 9.3 mm. Hg diastolic, even with a 3 minute immersion. Sullivan (7) demonstrated that the cold pressor reaction depends upon sudden stimulation of the cutaneous nerves of temperature and pain. He tested a syringomyelic patient with a transection syndrome with complete anesthesia below the first lumbar dermatome. The cold pressor test on the hand was positive while that on the foot was negative.

The work that is reported herein was done over a 10 year period beginning in 1940 with a project to study the cold pressor responses of agitated-depressive patients before and after shock therapy. However, while a control series consisting of hysterics and schizophrenics was being tested, it was found that all 4 cases of hysteria showed very slight responses, 1 case even registering a drop below the original base line readings. The attempt to follow up on this finding was dampened by the paucity of cases of conversion hysteria that occurred in the author's experience during the last decade. An exception was presented during the war but unfortunately the situation was complicated by the scarcity of ice in the tropical military areas where most of these patients were seen. Several opportunities were afforded to test cases where the differential diagnosis lay between hysteria and neurologic pathology where in the latter the signs were more slow in appearance than the symptoms.

Since the war a few more cases have been accumulated from private practice and on the Psychiatric Service of the Mt. Sinai Hospital. The case material and test results follow a note on 2 additional points of technic that were introduced with the method. First, the immersion was done for 2 minutes with four 30 second readings. This was done because it was felt that 4 readings might give more reliable data as well as to test whether the painful stimulus could break

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through an initial paradoxical response. Second, the pulse readings were taken simultaneously with the blood pressures to determine whether or not the heart rate might show any parallel or otherwise significant changes.

CASE MATERIAL AND TEST RESULTS

1. Control Cases

Hypertension was ruled out in all these patients. Final diagnoses were verified at staff conferences.

Case 1. A. N., 32-year old housewife. Diagnosis: Psychoneurosis, reactive depression with agitated features.

Basal readings: Blood pressure in mm. Hg, 124/78—Pulse—86			REMARKS
Immersion: 30 sec.	140/88	96	Patient tense, anxious.
60 sec.	158/94	104	Tension increased.
90 sec.	158/92	116	Grimaces of pain.
120 sec.	158/95	112	
Post-immersion:			
1 minute	142/92	98	Tension continues.
5 minutes	136/90	90	Asks if the test is finished.
10 minutes	128/92	88	Still anxious.
Average Rise:	+29/+14	+21	

Case 2. B. D., 54-year old salesman. Diagnosis: Involutional melancholia, manifested by depression, agitation, hypochondriacal delusions.

Basal Readings: Blood pressure 132/82—Pulse—78			REMARKS
Immersion: 30 sec.	148/96	88	"It's no use. This won't help me."
60 sec.	150/100	92	"I'll freeze to death."
90 sec.	150/100	90	"My stomach is all frozen."
120 sec.	152/98	92	Does not notice end of immersion.
Post-immersion:			
1 minute	140/90	88	"It's no use. My brain is gone."
10 minutes	134/84	80	"I'm never going to get better."
Average rise:	+18/+16	+12	

Case 3. H. E. F., 24-year old man, unemployed. Diagnosis: Schizophrenia with hebephrenic and paranoid features.

Basal readings: Blood pressure 120/75—Pulse—78			REMARKS
Immersion: 30 sec.	140/100	84	"I don't like this."
60 sec.	140/100	96	"It's all right now."
90 sec.	146/100	90	Smiles inappropriately.
120 sec.	146/100	90	Appears to be slightly anxious.
Post-immersion:			
1 minute	130/90	78	Smile reappears.
8 minutes	130/85	78	
Average rise:	+23/+25	+12	

Case 4. S. O., 28-year old man, tailor's assistant. Diagnosis: Psychoneurosis, manifested by neurocirculatory asthenia and episodic anxiety attacks when tachycardia occurs.

Basal readings: Blood pressure 116/74—Pulse—54			REMARKS
Immersion: 30 sec.	122/88	54	Patient very cooperative.
60 sec.	128/100	54	"This feels cold, but I don't mind."

90 sec.	130/92	66	
120 sec.	128/90	60	Slightly tense, but insists he feels fine.
Post-immersion:			
1 minute	120/80	54	
8 minutes	120/80	60	
Average rise:	+11/21	+5	

Case 5. W. L. L., 23-year old male student. Diagnosis: Psychopathic personality with anxiety state.

Basal readings: Blood pressure	128/70—Pulse—78	REMARKS
Immersion: 30 sec.	136/90	84 "I'll try anything once."
60 sec.	140/90	78
90 sec.	145/90	72 Smiles but seems tense.
120 sec.	140/85	72
Post-immersion:		
1 minute	130/82	72 Sigh of relief.
8 minutes	128/78	78
Average rise:	+12/+19	+1

Case 6. V. R., 28-year old man, an accountant. Diagnosis: Psychosis, unclassified.

Basal readings: Blood pressure	120/80—Pulse—84	REMARKS
Immersion: 30 sec.	130/90	114 Very tense.
60 sec.	150/90	120 Looks frightened.
90 sec.	145/90	108
120 sec.	140/85	96 Much more at ease.
Post-immersion:		
1 minute	125/82	90
8 minutes	125/82	84
Average rise:	+21/+9	+25

Case 7. L. S., 29-year old farm hand. Diagnosis: Psychosis, Psychosis with mental deficiency.

Basal readings: Blood pressure	122/78—Pulse—90	REMARKS
Immersion: 30 sec.	126/80	102 Very dull, placid.
60 sec.	124/72	96
90 sec.	122/80	96
120 sec.	122/80	90 No change throughout test.
Post-immersion:		
1 minute	124/84	96 No response.
8 minutes	124/82	96
Average rise:	+1/0	+6

Case 8. H. R. V., 36-year old man, unemployed. Diagnosis: Schizophrenia, Hebephrenic type.

Basal readings: Blood pressure	118/76—Pulse—90	REMARKS
Immersion: 30 sec.	118/80	96 Silly smile.
60 sec.	126/80	96 "Now I know I have water in my blood."
90 sec.	132/84	102
120 sec.	132/88	96
Post-immersion:		
1 minute	122/78	90
8 minutes	118/70	84
Average rise:	+9/+7	+8

Case 9. A. E. C., 33-year old man, a reporter. Diagnosis: Psychopathie Personality with chronic alcoholism.

Basal readings: Blood pressure	124/72—Pulse—72	REMARKS
Immersion: 30 sec.	154/90	84 Cooperative but tense.
60 sec.	158/96	90 "I could use a drink now."
90 sec.	156/96	78
120 sec.	150/92	72 "Do you ever do this test with gin?"
Post-immersion:		
1 minute	130/80	72
8 minutes	126/72	72
Average rise:	+30/+21	+9

Case 10. N. J. McI. 29-year truck driver's helper. Diagnosis: Schizophrenia, Cata-tonic Type.

Basal readings: Blood pressure	114/50—Pulse—72	REMARKS
Immersion: 30 sec.	118/62	78 Flexibilitas cerea.
60 sec.	126/70	78 Schnauzkrampf.
90 sec.	120/82	78 Moves both lower extremities.
120 sec.	126/88	78 Silly smile.
Post-immersion:		
1 minute	118/62	78
8 minutes	114/58	72 "I like this."
Average rise:	+8/+25	+6

Case 11. P. A. H., 39-year old shipfitter. Diagnosis: Schizophrenia; Simple Type.

Basal readings: Blood pressure	142/82—Pulse—78	REMARKS
Immersion: 30 sec.	176/106	78 Cooperative but tense.
60 sec.	180/108	72 Very tense.
90 sec.	180/100	72
120 sec.	180/90	72
Post-immersion:		
1 minute	155/86	72
8 minutes	142/80	84
Average rise:	+13/+8	-3

Case 12. S. C., 28-year old salesman. Diagnosis: Schizophrenia, Paraphrenia Fantastica.

Basal readings: Blood pressure	112/76—Pulse—84	REMARKS
Immersion: 30 sec.	122/80	84 Very much at ease.
60 sec.	126/82	78 "This is nothing."
90 sec.	126/88	90
120 sec.	126/86	90 Hums to himself.
Post-immersion:		
1 minute	118/75	78 Slight sigh of relief.
8 minutes	116/76	76
Average rise:	+13/+8	+1

2. Cases of Hysteria

Case 13. C. A., a 15-year old very well-developed school girl was known as "The Seal" because of the peculiar grunting sound that she emitted as often as 80 or 90 times an hour. Six months before admission to the Mosher Memorial Pavilion of the Albany Hospital in 1940, she had developed an acute but unrequited passion for a new family physician. This was followed by a 4-day episode of singultus which led in turn to globus hystericus with marked air-swallowing. It was in the expulsion of this air that her seal-like roaring manifested itself. One day before admission she developed paralysis of both lower extremities. There had been no response to intravenous sodium amytal given by the family physician (!).

In the hospital she regained the use of her legs but there was no other change at the time of discharge.

Mental examination showed marked "la belle indifference" with regard to her symptomatology. No deep dynamics could be worked out. A diagnosis was made of Psychoneurosis, Conversion Hysteria.

Cold pressor test was done on the day before discharge.

Basal readings: Blood pressure	98/58—Pulse—84	REMARKS
Immersion: 30 sec.	92/50	84
60 sec.	90/40 (?)	78
90 sec.	88/48	72
		No change in frequency of the grunting sounds.
120 sec.	88/52	84
		Interest in the procedure very slight.
Post-immersion:		
1 minute	94/60	90
10 minutes	100/60	84
Average rise:	+9/+11	+5

Case 14. D. D., a 23-year old girl of moderate development and marked hirsutism was admitted to the Albany Hospital in 1940 for epileptiform seizures of 3 years duration. She had been under treatment with phenobarbital for the greater part of this time without change in symptoms. It was discovered that the attacks occurred only at night during sleep and usually within the same hour night after night. During the attack it was noted that the patient's movements resembled those of a female in sexual intercourse. There was none of the classical signs of the epileptic fit. During waking hours the patient showed marked indifference to her attacks of which she insisted she knew nothing except what she had been told.

The patient made an excellent response to confrontation with the apparent nature of the symptoms. She recalled as a girl of 11 awakening at night to hear her parents quarreling in the adjoining bedroom. As she strained her ears to hear what was going on she also heard sounds suggesting sexual intercourse. Later on she would fantasy herself in the sexual act. Eight years later her parents were divorced. It was in the following year when she had become involved in an affair with a man 22 years her senior that her epileptiform attacks began. There were no more attacks following psychotherapy. Phenobarbital had been discontinued after the attacks were witnessed. A diagnosis was made of Psychoneurosis, Conversion Hysteria, Hysterical Epileptiform Seizures.

A Cold pressor test was performed during the period that the attacks were occurring.

Basal readings: Blood pressure	114/70—Pulse—84	REMARKS
Immersion: 30 sec.	116/74	96
60 sec.	118/76	90
90 sec.	120/80	96
120 sec.	115/72	96
		"It isn't so bad now—I guess I'm numb!"
Post-immersion:		
1 minute	116/70	90
10 minutes	112/68	84
Average rise:	+3/+5	+10

Case 15. B. C., a 20-year old, very well-developed woman was brought to the Emergency Room of the Albany Hospital in 1940 with amnesia for identity and orientation as well as pseudo-nominal aphasia. She had been picked up by the police as she was aimlessly wandering around a slum area in the early morning. She had to be taught that she was a girl, that she was in a hospital, what a hospital is, such names as spoon, fork, dish, dress. There was a complete "la belle indifference" as to her identity after her vocabulary had improved to the point where the pseudo-nominal aphasia had disappeared.

During and following intravenous sodium amytal a classical picture of amnesia with

fugue was slowly and reluctantly revealed. She was anxious and incensed at her recovery insisting that she was very happy when she didn't know anything about herself. She had run away from a farm in a midwestern state after being forced by her mother to marry a 37-year old farmer. She had worked for a while as a seamstress in a factory until some man had frightened her with his attentions. She left this place and began to hitch rides on trucks. It was at night after leaving Rochester, N. Y. that she went "blank." The amnesic phase between Rochester and her arrival in Albany was not cleared up. She responded very well however, to reconciliation with her husband, a very personable individual, who came East to fetch her home. Four years later she wrote that she was happy with her husband and their 3-year old son. Diagnosis: Psychoneurosis, Conversion Hysteria, Amnesia with Fugue.

Cold pressor test was done during the amnesic period.

	Basal readings: Blood pressure	112/78—Pulse—90	REMARKS
Immersion: 30 sec.	114/76	90	Patient had very intense positive transference and complied very obediently with all requests.
60 sec.	114/72	90	
90 sec.	116/74	84	
120 sec.	114/74	90	"This isn't so bad."
Post-immersion:			
1 minute	114/78	90	"You can do it again anytime you want to."
10 minutes	112/76	90	
Average rise:	+2/-4	-1	

Case 16. F. F., a 12-year old school girl of very precocious development was admitted to the Albany Hospital in 1940 with paralysis and anesthesia of the right upper extremity of 1 day's duration. No neurological pattern could be established. The history given by her step-mother was vague. The patient was not inclined to talk very much. She expressed no concern with her paralysis with "la belle indifference" to skin puncture on the fingers, hand and forearm. When the needle was applied to the skin over the right shoulder she winced slightly but denied that she felt any pain. It was eventually possible through Social Service to get a history of severe abuse by the step-mother who favored her own 3 children and resented the patient's interest in her eldest son, a boy of 15.

No dynamics could be worked out with the patient whose symptoms subsided within 3 days when she was discharged against advice upon insistence of her father. A diagnosis was made of Psychoneurosis, Conversion Hysteria.

On the second day after admission the cold pressor test was done.

	Basal readings: Blood pressure	116/60—Pulse—72	REMARKS
Immersion: 30 sec.	112/60	72	<i>Right hand was immersed.</i>
60 sec.	110/62	72	Patient gave no evidence of any discomfort during the immersion.
90 sec.	110/54	66	
120 sec.	110/58	66	
Post-immersion:			
1 minute	116/62	66	No change in attitude.
10 minutes	118/64	72	
Average rise:	+4/+2	+3	

Case 17. P. P., a 34-year old woman, single, file clerk was admitted to the Boston Psychopathic Hospital in 1941 with a history of singultus of 3 weeks duration. She had recently been severely disappointed when her employer, whom she fancied was in love with her, had become engaged to a wealthy socialite. The hiccupping began at the office immediately after she heard the news and reached such severity that she was unable to return to work the next day. There was a history of a similar attack 14 years previously when her father committed suicide. At that time she became very anxious about the singultus and appeared to show no grief. In the present instance, the pattern was similar in that she showed no concern about her disappointment in love but rather was preoccupied with her hiccupping. A diagnosis of Psychoneurosis, Conversion Hysteria was made.

A cold pressor test was performed on the third day of her admission.

Basal readings: Blood pressure 138/98—Pulse—84			REMARKS
Immersion: 30 sec.	135/95	96	Hiccoughing every 1 to two minutes.
60 sec.	132/100	96	Says she is not nervous about the test.
90 sec.	140/105	96	Hiccoughing about the same. Occasional fleeting facial motion.
120 sec.	140/100	84	(Hiccough)
Post-immersion:			
1 minute	136/95	78	"That was real cold!"
10 minutes	128/92	78	Hiccoughing much decreased.
Average rise:	-1/+2	+9	

Case 18. C. H., a 14-year old negro school girl, precociously developed, was admitted to the Boston Psychopathic Hospital in 1941 with a vague history of almost daily attacks of loss of consciousness; she states, however, that she knows everything that is going on but feels as if she is asleep. Physical and neurological examinations were negative. She did not appear to be very intelligent. The intelligence quotient was found to be 78 although its validity was questioned because of patient's lack of complete attention. Family periodic paralysis was ruled out by the negative family history and failure to respond to treatment with potassium chloride, given 5 gm. daily for 1 week. A tentative diagnosis was made of Psychoneurosis, Conversion Hysteria, although at Staff Conference it was felt that there were some associated schizoid features.

Cold pressor test was done before medication was given.

Basal readings: Blood pressure 130/80—Pulse—84			REMARKS
Immersion: 30 sec.	140/100	84	Quietly indifferent.
60 sec.	140/85	84	No anxiety.
90 sec.	130/80	84	
120 sec.	135/85	78	
Post-immersion:			
1 minute	125/80	78	Said she was a big girl for her age.
10 minutes	130/85	78	"Everybody says I act older than I am."
Average rise:	+3/+7	-2	

Case 19. A. W. J., a 29-year old private was admitted to the Walter Reed General Hospital from overseas service in February 1943. Onset of symptoms of paralysis of the right upper extremity dated from June 1941 during invasion training in Ireland. The paralysis would come on intermittently but seemed to subside rapidly whenever he was returned to quarters. During the invasion of North Africa in November 1942, he found he was unable to use his right arm and hand in handling his gun and he was evacuated shortly after the landing. He continued to have the paralysis. Neurological examination at the Walter Reed Hospital was negative. The secondary gain motive was very clear since the patient made no bones about his eagerness to secure the certificate of disability discharge. A diagnosis was made of Psychoneurosis, Conversion Hysteria, with possible secondary malingering.

A cold pressor test disclosed:

Basal readings: Blood pressure 115/75—Pulse—84			REMARKS
Immersion: 30 sec.	130/80	90	The "paralyzed arm" was used
60 sec.	110/90	84	without any objections on the part of the patient.
90 sec.	110/90	78	Winces slightly.
120 sec.	130/90	78	
Post-immersion:			
1 minute	125/75	78	
10 minutes	120/70	78	
Average rise:	+5/+12	+4	

Case 20. J. DeG., a 22-year old Navy veteran was treated privately in 1946 under Veteran's Administration Authorization. He presented a classic picture of the G. I. who constantly resented authority but who could be reasoned with at all times with considerable resultant insight. He had persistent high back and chest pain throughout his tour of duty and these symptoms had continued into civilian life. They represented his excuse for his indecision, anxiety and vacillation between continuing with high school education or going to work. He would often feel like throwing everything over and returning to the Navy. He had many dreams in which his family visited him on some distant Navy base. Complete physical and neurological as well as X-ray studies were negative. A diagnosis of Psychoneurosis, Anxiety Hysteria was made.

Cold pressor test findings follow:

Basal readings: Blood pressure			Pulse—96	REMARKS
Immersion: 30 sec.	102/78	96		"Ouch, this hurts!"
60 sec.	90/68	84		"Funny, its o.k. now."
90 sec.	88/52	84		
120 sec.	88/50	78		"Don't take it out."
Post-immersion:				
1 minute	110/80	84		"That's not so bad after all."
10 minutes	108/80	90		"Besides, it's for science."
Average rise:	-28/-17	-10		

Case 21. T. R., a 30-year old married negress who was admitted on Dec. 15, 1947 to the Mt. Sinai Hospital with total loss of memory and personal identity. The fugue began on the day of admission and lasted several hours. A friend found her wandering about in a daze and brought her to the hospital. There was a history of 2 previous fugue states. On admission the patient was disoriented in all spheres, slow and hesitant in speech. All laboratory studies were negative. During her first 2 weeks in the hospital, hypnosis, sodium amytal, nitrous oxide anesthesia were ineffective. An intravenous sodium pentothal interview, however, recovered details of the patient's early history, following which the dynamics of the fugue were then worked out. A diagnosis was made of Psychoneurosis, Conversion Hysteria, Fugue type.

Two cold pressor studies were performed. The first on Dec. 26, 1947 prior to any change in the amnesic state. The second test was done on Jan. 8, 1948, one day after the successful sodium pentothal interview broke through the amnesia.

Test of Dec. 26, 1947:

Basal readings: Blood pressure			Pulse—84	REMARKS
Immersion: 30 sec.	138/86	88		After 30 minutes bed rest.
60 sec.	130/88	84		No change of expression.
90 sec.	130/84	84		Patient mute.
Post-immersion:				
5 minutes	130/84	84		
Average rise:	+4/+5	+2		

Test of Jan. 8, 1948:

Basal readings: Blood pressure			Pulse—80	REMARKS
Immersion: 30 sec.	126/84	100		After 30 minutes bed rest.
60 sec.	124/84	88		Grimaces as hand goes into ice water.
Post-immersion:				
1 minute	126/80	84		Quiet—no expression of pain.
Average rise:	-1/+10	+14		Says that test does not bother her now—"I'm used to it."

3. Cases Involving the Differential Diagnosis of Hysteria

Case 22. M. C., a 28-year old single stenographer was followed for 3 years in the Neuropsychiatric Outpatient Department of the Albany Hospital. She complained of diffuse

anesthesias and parathesias. Spinal fluid studies done on one occasion in 1939 were negative. She had been repeatedly examined by several neurologists on the hospital staff and had finally been diagnosed as an hysteria. In 1941 unmistakable signs of multiple sclerosis appeared with increase of spinal fluid protein to 73 mg. per cent.

A cold pressor test was done in 1939. The notation of the exact figures of the test were misplaced but I recall the figures as well above an average rise of plus 15 because at that time I had diagnosed the patient as a conversion hysteria and was disappointed to find the cold pressor test readings so high. The final diagnosis explained the discrepancy.

Case 23. E. M. T., a 34-year old paratrooper was admitted to the 43rd Station Hospital in 1943 with a 3 day complaint of severe weakness in both legs which felt "like they are paralyzed." His battalion surgeon believed that the patient was either an hysteric or a malingerer. There had been a very high casualty rate during the recent paratroop invasion of Sicily. A shipment of ice had just arrived from a Navy friend at Bizerte and I ran the cold pressor test before the North African sun disposed of the ice and also before I had done a neurological examination. The cold pressor test showed an average rise of 14 systolic and 13 diastolic. The physical and neurological examination disclosed diffuse neurofibromatosis with a neurofibroma of the spinal cord at the level of the 12th thoracic vertebral spine. The tumor was successfully removed by neurosurgeons of the Third General Hospital (The Mt. Sinai Unit) then located at Mateur in Tunisia.

Case 24. H. C., a 19-year old orphaned boy spent 14 years of his life in various homes, orphanages, hospitals and other institutions because of rheumatic valvular disease. He was admitted to the Goldwater Memorial Hospital in September 1949 for recurrent attacks of right-sided hemiplegia. Repeated neurological and spinal fluid studies showed no evidence of organic disease despite the likelihood of cerebral embolism. The patient has an intelligence quotient of 125. Rorschach studies showed marked use of repressive mechanisms and a suggestive but a typical hysterical pattern. Clinically, he showed a considerable degree of "la belle indifference" with regard to his situation although at the time of the examination in November 1949 he no longer had the hemiplegia.

A cold pressor test was performed:

Basal readings: Blood pressure		122/60—Pulse—72	REMARKS	
Immersion: 30 sec.		122/60	72	Right hand was used. Very compliant.
60 sec.		118/60	92	Denies any discomfort.
90 sec.		122/60	96	Very calm.
120 sec.		132/70	84	Winces slightly.
Post-immersion:				
1 minute		130/55	76	
8 minutes		120/68	72	
Average rise:		+1/+2	+14	

The test results reveal the following findings in the patients that were studied:

1. The control group consisting of anxiety states, schizophrenies, compulsive-obsessives, alcoholics and psychoses with mental deficiency showed an average cold pressor rise of 17.6 mm. Hg. systolic and 15.3 mm. Hg diastolic. The rise in pulse rate was 8.4 per minute.
2. The hysteria group showed an average cold pressor drop of 2.5 mm. Hg systolic and a rise of 0.7 mm. Hg diastolic. The rise in pulse rate was 1.6 per minute.
3. The readings obtained in the two-minute test were broken down to study the value of the longer test time compared with the original 1 minute time reported in the literature.

The results shown in Table I indicate that the trend in the blood pressure that is indicated in the 1st minute of immersion is continued and intensified in the 2nd minute.

However, the pulse rate findings were equivocal.

4. The changes in the pulse rate as indicated by the considerable difference found be-

tween the control cases and hysteria groups, namely, 8.4 and 1.6 per minute respectively, point to the value of this index in the cold pressor test.

TABLE 1

FIRST MINUTE AVERAGE RISE			SECOND MINUTE AVERAGE RISE		
Systolic	Diastolic	Pulse	Systolic	Diastolic	Pulse
Control group 15.0	14.6	8.1	19.4	16.0	7.9
Hysteria group -22.0	1.0	1.0	-47.0	-0.7	-4.7

DISCUSSION

The above findings would no doubt be more significant if they were based upon a much greater number of cases. However, it is felt that even the tentative results are strongly suggestive of the paradoxical response that is so characteristic of the clinical picture in conversion hysteria and for which I would hazard the term "physiological negativism". The clinician has long been impressed with the ear that refuses to hear, the eye to see, the muscle to move, the nerve endings of the skin to feel, etc.

The cold pressor stimulus excites the pain fibers to respond with a rise in blood pressure. The controls respond promptly but the hysterics not only refuse to manifest more than a fraction of the average individual's response but even drop below the preimmersion base line readings. The controls show various more or less manifest anxiety or tension reactions. The cold-pain stimulus evokes more anxiety and tension, hence the rise far above the normal response. But what happens to the anxiety that the hysteric has deeply buried beneath his bland indifference? The psychodynamic analysis of the hysteric brings out the presence of this anxiety, a very frequent phenomenon that appears whenever the hysterical symptom is broken through too rapidly as in Case 15. This anxiety appears to be no different from the anxiety seen in other emotional disorders. Therefore the hysteric must employ a special mechanism by which the anxiety is denied expression.

This leads us directly to the speculation that the hysteric has the faculty to exhibit a form of negativism in which the vasomotor system takes part as demonstrated by the paradoxical cold pressor response, i.e., subjectively or objectively. Some writers are convinced that conversion hysteria is a distinctly different entity from the neuroses (8) (9) and may have some organic or constitutional components. There is no evidence to support these contentions. It is noteworthy, however, in Case 21 that the patient showed the paradoxical response after, as well as before, the pentothal interview that broke through her conversion symptoms. In several other cases paradoxical response was elicited after the hysterical symptom had disappeared. This would seem to indicate that the potential for the paradoxical response is present whether or not the individual is manifesting the hysteria.

This bears out the psychoanalytical understanding of the hysteric which

includes the predisposition of the individual toward the development of a fixation at the phallic stage of libidinal development. Once this predisposition has become activated by events in the early infantile period, the individual is conditioned to the potential anxiety that can be set in motion by any group of circumstances that has a traumatic bearing upon his sexual life. The significant feature that is stressed is the "status hystericus" situation that is prepared to bind any and all anxieties by the physiological denial of some body function that is usually of symbolic significance in the sexual conflict.

This negativism was pointed out in a paper by Allen (9) in which he demonstrated the presence of an "hysterical Babinski", in which with psychotherapy the plantar response returned to normal. He postulated that, "in a limb showing the motor effects of hysteria, on command or spontaneous conscious effort or cutaneous stimulation, there is inhibition of the motor impulses to the agonist muscles related to the movement. In less severe cases the motor impulse to the agonists is replaced by a motor impulse to the fixing muscles in very mild cases, the motor impulse goes to the antagonist muscle or muscles". And finally, "this replacement of agonist response by antagonist action is the result of factors operating at the unconscious level of the higher cortical functions". Hence a pseudo-Babinski reaction is a complete possibility where the lower extremity enters into a symbolic role in a particular conflict. Recently Gidro-Frank and Buch (10) have elicited an infantile plantar response in hypnotic age regression.

It is particularly interesting in this connection to read Freud's remarks on hysterical attacks in a 1909 paper (11): "A particularly effective form of distortion is *antagonistic inversion of the innervation*, which is analogous to the very usual changing of an element into its opposite by dream-work. For instance, in an hysterical attack an embrace may be represented by the arms being drawn back convulsively until the hands meet above the spinal column. "*possibly the well known 'arc de cercle' of major hysterical attacks is nothing but an energetic disavowal of this kind, by antagonistic innervation of the position suitable for sexual intercourse*".

The questions that are now posed by the accidental findings with the cold pressor test are these: Does this paradoxical vasomotor reaction underlie the mechanism of the conversion phenomena that hysteria presents? Does the hysteric make use of a constitutional ability to be negativistic at a physiological level? What bearing does this finding, if substantiated by other workers, have upon our further understanding of this most intriguing and dramatic of all the mental disorders? Finally, has the test any practical immediate value in the differential diagnosis of conversion hysteria from organic disorders that it so often mimics? Cases 22, 23 and 24 suggest that there may at least be an answer to the last question in the preceding list even though it be empirical.

SUMMARY

1. The use of the cold pressor test in testing vasomotor responses in various mental disorders yielded the accidental finding of a paradoxical response in a case of conversion hysteria.

2. A study of a control group consisting of anxiety neuroses, schizophrenics

manic-depressives, alcoholics, constitutional psychopathic states and compulsive-obsessives revealed a high anxiety response.

3. Tests done on a conversion hysteria group showed consistently low responses including several minus responses.

4. In 3 cases differential diagnosis between organic conditions and conversion hysteria supported the suggested significance of the test.

5. It is admitted that the statistical validity is questionable because of the size of the samples studied but it is felt that a definite trend is indicated by the findings.

6. The use of the 2 minute test rather than Hines and Brown's 1 minute test tends to confirm and exaggerate the trends that appear in the 1 minute immersion.

7. The pulse rate has been shown to be a useful corroborating index together with the blood pressure in the cold pressor test. However, in any given case pulse rate findings alone may be equivocal.

8. The possible role of a vasomotor mechanism is discussed with reference to its universal application in the understanding of the physiology of conversion symptom formation.

9. The concept of "physiological negativism" is suggested as part of the mechanism of conversion symptom formation.

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ABSTRACTS

AUTHORS' ABSTRACTS OF PAPERS PUBLISHED ELSEWHERE BY MEMBERS OF THE MOUNT SINAI HOSPITAL STAFF

Members of the hospital staff and the out patient department of the Mount Sinai Hospital are invited to submit for publication in this column brief abstracts of their articles appearing in other journals.

Mechanism of the Postgastrectomy Syndrome. D. ADLERSBERG AND E. HAMMERSCHLAG. J. A. M. A., 139: 429, February, 1949.

The complex symptoms encountered in a group of 20 patients who, after partial gastrectomy for ulcer, presented difficult nutritional problems, are divided into two groups: "early" and "late" postprandial symptoms. The early symptoms are epigastric pressure, nausea, fullness, eructation and belching, dizziness and occasional vomiting. They are attributed to mechanical factors: distension and rapid emptying of the small stomach and over-flooding of the small intestine. Gastritis of the stump as well as jejunitis may be predisposing factors. The later symptoms are headaches, fatigue, weakness, perspiration, palpitation, dizziness, shortness of breath and, occasionally, precordial pressure. These symptoms are attributed to chemical factors: hypoglycemia secondary to the exaggerated postprandial hyperglycemia. The possibility of increased insulin sensitivity is discussed. The postgastrectomy syndrome is caused by a combination of these factors with distinct psychoneurotic disturbances. The postoperative course, as well as the postgastrectomy symptoms, add insult to injury and contribute to the development of a vicious circle, wherein the postprandial distress and fear to eat are outstanding factors. The clinical, nutritional and psychological aspects of treatment of these patients, frequently involving great difficulties, as well as the possibility of prophylaxis, are discussed.

Treatment of Primary Atypical Nonbacterial Pneumonia with Aureomycin. E. B. SCHOENBACH, AND M. S. BRYER. J. A. M. A., 139: 275, January, 1949.

Eighteen patients with Primary Atypical Nonbacterial Pneumonia were treated with oral aureomycin. These patients were all hospitalized and febrile; most showed no response to penicillin; white blood counts were normal or low in most cases; cultures of blood, urine, sputum, and nasopharynx yielded no pathogens, and all had x-ray evidence of pneumonic infiltrations compatible with a typical pneumonia. Cold hemagglutinins were present in 50 per cent and agglutination for *Streptococcus MG* was positive in 75 per cent of these patients. Complement fixation tests for psittacosis and Q fever were negative in all cases. Chick cell agglutination tests for 4 strains of influenza virus were negative in all the patients. Prompt clinical improvement was noted soon after therapy with aureomycin was instituted. Most patients became afebrile in 24 to 36 hours. An oral dosage schedule of 30 to 50 mg of aureomycin per kilogram of body weight per day was employed. The total daily dose was divided into 4 to 6 parts. Other than occasional nausea or vomiting, no toxicity was noted.

The Distribution of Histochemically Demonstrably Glycogen in Human Blood and Bone Marrow Cells. M. WACHSTEIN. Blood, 4: 54, January, 1949.

By applying Schiff's reagent after periodic acid treatment to blood and bone marrow films, a cytoplasmic staining reaction is seen in some cells of the myeloid series, as well as in megakaryocytes and platelets. The intensity of the staining reaction in the myeloid cells increases with their maturation. The staining reaction can be prevented altogether

in alcohol-fixed films by salivary digestion, but only incompletely in air-dried films. The staining reaction is due to the presence of glycogen in some chemical association, possibly with protein.

Blocking Action of Tetraethylammonium on Axon Reflexes in the Human Skin. H. D. JANOWITZ, AND M. I. GROSSMAN. *Science*, 109: 16, January, 1949.

Tetraethylammonium is believed to exert its effects by specific blockade of autonomic ganglia. This report details evidence that tetraethylammonium may exert an action on peripheral nerve fibers. By employing axon reflexes of the human skin dependent on the integrity of postganglionic sympathetic fibers, we have been able to block the reflexes of pilomotion and sweating induced by acetylcholine following local infiltration of the skin with tetraethylammonium.

The Effect of Secretin on Bile Formation in Man. M. I. GROSSMAN, H. D. JANOWITZ, H. RALSTON, AND K. S. KIM. *Gastroenterology*, 12: 133, January, 1949.

Since direct evidence of the effect of secretin on bile formation in man did not exist, the present report furnishes evidence that intravenous secretin in five subjects stimulates the formation of bile. The increase in volume of bile after secretin is accompanied by a decrease in viscosity, bilirubin and cholic acid concentration, and an increase in water content, closely resembling the response to sodium hydrocholate.

The Agglutination of Human Erythrocytes Modified by Treatment with Newcastle Disease and Influenza Virus. A. L. FLORMAN. *J. Bact.*, 57: 31, January, 1949.

Sera from patients with infectious mononucleosis, which agglutinate human red cells modified with Newcastle disease virus (NDV), do not agglutinate human cells modified by PR8 or Lee viruses or by normal allantoic fluid (NAF). Not all patients with infectious mononucleosis develop the capacity to agglutinate NDV-treated cells. Serum from an occasional patient with hepatitis or serum sickness may also agglutinate these cells. anti-NDV rabbit sera contain several agglutinating factors for NDV-modified erythrocytes, at least one of which appears to be specific. The agglutinating factors in anti-PR8, anti-Lee and anti-NAF rabbit sera are all removed by absorption with normal chick tissue. Serum from a patient convalescing from infectious mononucleosis that has a titer for NDV-modified cells comparable to that of an anti-NDV rabbit serum differs from the latter in that it does not contain any NDV agglutination-inhibition antibody.

The Use of Propionates in Ophthalmology. F. H. THEODORE. *Arch. Ophth.*, 41: 83, January, 1949.

The use of the lower fatty acids as non-toxic fungistatic and anti-bacterial agents was first introduced in dermatology in the form of sodium propionate. The present report is the first one concerning the value of fatty acids in infections of the lids, conjunctiva, and cornea. A 5 per cent aqueous solution buffered to pH 7.3 was used. Laboratory studies with this solution demonstrated bacteriostatic effects upon staphylococcus aureus, streptococcus hemolyticus, streptococcus viridans, B. pyocyaneus and B. subtilis. Clinical studies in almost 400 cases gave excellent results in acute bacterial conjunctivitis. In chronic infections, especially chronic blepharo-conjunctivitis, sodium propionate proved efficacious in most cases, often where patients no longer could tolerate other antibiotics. Moreover, it appeared to be of special value in those cases of blepharo-conjunctivitis, in which both yeast and staphylococci were found, probably because of its combination of fungistatic and anti-bacterial activity. Sodium propionate was also effective in superficial corneal infections of bacterial origin. Aside from its soothing action, it was of little value in viral infections.

Cardiac Complications in Electroshock Therapy. L. LINN, AND J. G. OTTENHEIMER. *Dis. Nerve. System*, 10: 8, January, 1949.

A case is reported of acute coronary insufficiency with auricular fibrillation following electroshock therapy (EST) in a 57 year old woman whose pre-treatment ECG was normal.

The cardiac complication occurred after the 3rd treatment, the first 2 having proceeded without incident. Because the cardiac irregularities following EST are believed to be due to vagal reflexes, routine atropinization of elderly EST patients is recommended as a result of this experience. Other prophylactic recommendations included repeated clinical and laboratory examinations of the heart and the maintenance of an adequate airway during treatment.

Arterial Anomalies of the Spinal Cord. J. A. EPSTEIN, A. J. BELLER, AND I. COHEN. J. Neurosurg., 6: 45, January, 1949.

Six cases of arterial anomalies of the spinal cord are described and the literature reviewed. The age span of the entire group is 35-62 years. Symptoms are either progressive or intermittent with ultimate progression. No congenital malformations or nevi were observed. Findings included a combination of signs of intra- and extra-medullary cord disease with root compression. Myelography specifically disclosed dispersal of the pantopaque into small rivulets and droplets outlining tortuous vessels. The lesion is made up of serpentine, tangled and convoluted vessels filled with bright red blood. Radiotherapy is contraindicated. Any operative procedure other than decompression is hazardous.

The Agglutination of Human Erythrocytes Modified by Treatment with Newcastle Disease and Influenza Virus. A. L. FLORMAN. J. Bact., 57: 31, January, 1949.

Sera from patients with infectious mononucleosis, which agglutinate human red cells modified with Newcastle disease virus (NDV), do not agglutinate human cells modified by PR-8 or Lee viruses or by normal allantoic fluid (NAF). Not all patients with infectious mononucleosis develop the capacity to agglutinate NDV-treated cells. Serum from an occasional patient with hepatitis or serum sickness may also agglutinate these cells. Anti-NDV rabbit sera contain several agglutinating factors for NDV-modified erythrocytes, at least one of which appears to be specific. The agglutinating factors in anti-PR-8, anti-Lee, and anti-NAF rabbit sera are all removed by absorption with normal chick tissue. Serum from a patient convalescing from infectious mononucleosis that has a titer for NDV-modified cells comparable to that of an anti-NDV rabbit serum differs from the latter in that it does not contain any NDV agglutination-inhibition antibody.

Methyl Green-Pyronin I Basis of Selective Staining of Nucleic Acid. N. B. KURNICK. J. Gen. Physiol., 33, January, 1950.

The selective staining observed in tissue sections with methyl green-pyronin, in which methyl green stains desoxyribonucleic acid (DNA), and pyronin stains ribonucleic acid (RNA), was explored *in vitro* with the use of pure nucleic acids, nucleoproteins, and isolated thymus nuclei. It was found that the selectivity of these two basic dyes was determined by the degree of polymerization of the acid substrates. Depolymerized DNA stained selectively with pyronin as did RNA, which is known to occur only as a low polymer. Polymerized DNA and desoxyribonucleohistone stained selectively with methyl green. The DNA may be depolymerized by the specific enzyme or by heat. Treatment of isolated DNA or of nuclei as in Feulgen hydrolysis resulted in depolymerization and reversal of staining. Methyl green did not stain polymerized bacterial polysaccharides. Ethyl green and malachite green demonstrated the same specificity for polymerized DNA as did methyl green, whereas crystal violet and Victoria Blue did not. This suggests that triphenyl-methane dyes with two amino groups are specific while those with three are not. A steric explanation is offered. It was noted that the absorption spectrum of methyl green, malachite green, and phenosafranin are shifted toward longer wave-lengths in the presence of polymerized DNA but not in the presence of depolymerized DNA or RNA in similar concentration. It is suggested that these highly ionized dyes are capable of dimerization in simple aqueous solution.

A Method of Continuous Arterial Infusion: Bone Marrow and Blood Levels during the Administration of Penicillin. S. S. SCHNEIERSON AND L. BLUM. Surgery, 25: 3, January 1949.

The Brewer automatic pipetting machine has been successfully adapted for continuous arterial infusion. The apparatus is illustrated and described. Penicillin in various doses was infused into the femoral arteries of dogs and then levels in the bone marrow of the femur and tibia and of the blood obtained from the marrow cavities, femoral vein and a peripheral vein were determined. A high and constant level of penicillin was found in the bone marrow with continuous arterial infusion into the supplying artery. It was also noted that the penicillin levels of the blood from the marrow cavity and the femoral vein were considerably higher than the general blood level. The theoretical basis for these results is discussed. Examination of the arteries of 3 dogs after the infusion at varying intervals showed no gross or microscopic abnormalities other than those considered within the scope of the normal reparative process.

Enhancement of Penetration of Penicillin into Inflamed and Normal Mucous Membrane by Hyaluronidase. M. L. SOM. Proc. Soc. Exper. Biol. & Med., 70: 96, January, 1949.

The maxillary sinuses were first irrigated with normal saline and then the antibiotic was introduced through the same cannula. The instillation of 200,000 units of crystalline penicillin G into the diseased and normal paranasal antrum is well tolerated and except for the development of an allergic reaction in one patient, was without any adverse effect. In 24 out of 26 patients with chronic suppurative disease of the sinuses and in all 5 normal subjects, a significant penicillin level in the blood was found after the intra-antral instillation. In both groups, the addition of hyaluronidase to the instilled penicillin resulted in even higher blood levels than those found without its use, with one exception. In two patients in whom no blood level could be demonstrated, the addition of hyaluronidase resulted in a significant concentration of penicillin in the blood. It is postulated that the increased blood penicillin level following hyaluronidase is due to greater diffusion and penetration of the penicillin as a result of the spreading action of hyaluronidase.

Cholecystitis Emphysematosa. E. F. JEMERIN. Surgery, 25: 237, February, 1949.

Cholecystitis emphysematosa is an acute inflammation of the gall bladder due to gas producing organisms with gross accumulation of gas within the wall and lumen of the organ and frequent extension outside it into the pericholecystic area. The gas produced is demonstrable radiographically. The culpable organism is almost always one of the anaerobes of the clostridium group. The infection may vary from mild to fulminating, although some degree of destruction of the gall bladder wall is the rule. The diagnosis is made by the demonstration of gas in the gall bladder wall either by X-ray or in the gross specimen. Differentiation must be made from a fistulous communication with the gastrointestinal tract. Treatment is surgical. A case is reported in which gas within and around the gall bladder as well as in the wall was demonstrated both by X-ray and at operation.

New Applications of Chest Lead Diagrams and Circumferential Leads in Clinical Cardiology. B. KISCH. Exp. Med. & Surgery, 7: 1, February, 1949.

It was the purpose of this presentation to give in a very short outline a picture demonstrating the manner in which circumferential leads may yield clinical information more valuable than that obtained by taking only the six chest leads and to show how chest lead diagrams aid in ascertaining the results with one glance.

Some Psychosomatic Aspects of the Management of Surgical Patients. MACK LIPKIN AND EDWARD JOSEPH. Surgery, 25: 268, February, 1949.

This essay is primarily a plea for the clearer recognition by surgeons of the emotional problems of patients having operations. Most surgical patients are tense and anxious, partly because of accumulations of misinformation, partly because of inner conflicts. They need very careful preoperative correction of their fears and apprehensions. The preoperative, operative and postoperative periods each contain psychologic hazards which can be met successfully by relatively simple methods. Patients need psychologic as well as physical measures to hasten and to complete convalescence. The paper offers a variety of concrete suggestions for minimizing the psychologic problems of surgical patients.

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PULMONARY ARTERIOVENOUS ANEURYSM

REPORT OF THREE CASES

BRIAN BLADES, M.D.* AND EDWARD BEATTIE, JR., M.D.†

Pulmonary arteriovenous aneurysms were once thought to be very rare, but they are now being found with increasing frequency. When Yater and co-workers (1) reviewed the world's literature in 1949, they found that there were 45 known cases, 26 of which had been treated surgically. Yater's series included 2 cases of Blades which are being reported in this paper. Lindskog (2) reported 4 additional cases in 1950; he operated upon 3 of these cases. Carswell (3), in 1950, reported one case which he had operated upon. Lawrence and Rumel in 1950 (4), reported 2 that they had treated surgically. This paper reports our surgical experience with 3 cases. Thus far at least 53 cases have been diagnosed, and 33 of these cases have been operated upon.

Historical Background. The early cases of pulmonary arteriovenous aneurysm were found only at autopsy. Churton (5) in 1897, Wilkens in 1918 (6), de Lange and De Vries Robles in 1923 (7), Reading in 1932 (8), and Rodes in 1938 (9), have described lesions discovered at autopsy. Diagnosis before autopsy was first made in 1939 by Smith and Horton (10). Hepburn and Dauphinee successfully treated the first case in 1942 by performing a pneumonectomy.

Diagnosis. Arteriovenous aneurysms in the lung are part of the syndrome known as Rendu-Osler-Weber's disease or hereditary hemorrhagic telangiectasia. Familial tendency, skin lesions, and mucous membrane involvement may be lacking in pulmonary arteriovenous aneurysms.

One half of the reported cases of pulmonary arteriovenous fistulas have had multiple spiderly telangiectases and discrete nodular hemangiomas of the face, neck, lips, mucous membranes, or trunk. Cyanosis and clubbing of the fingers and toes, in the presence of a normal heart and evidence of tumefaction in the lungs, are the essential features in the diagnosis of intrapulmonary aneurysms. The aneurysm permits venous blood to be shunted into the systemic circulation and a lowered arterial oxygen saturation results; arterial oxygen saturations as low as 63 per cent have been reported. This lowered arterial oxygen saturation may or may not result in cyanosis. If the fistula is large, an excess number of red blood cells will be produced. The increase in red blood cell production may increase the blood volume, but the plasma volume is usually normal. The polycythemia which is thus developed may cause a chain of central nervous system

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symptoms such as headache, vertigo, syncope, convulsions, paresis or parathesias, dysphagia and dysarthria.

The heart is usually normal, and the right ventricle is not increased in size. The cardiac output is not elevated and the systemic blood pressure is usually normal; the venous pressure is unchanged. The electrocardiogram is not abnormal, although occasionally right or left axis deviation may develop. The circulation time is not prolonged. A murmur, continuous throughout the cardiac cycle, is usually heard; it is loudest on inspiration and may fade or be absent on expiration. X-ray films of the chest are typical; they usually show shadows in the chest connected to the hilum by prominent vascular shadows. The angiocardigram is pathognomonic when the aneurysm fills with dye. The intrapulmonary fistulas may be distinguished from aneurysms by findings in the systemic circulation. In the latter there is an increase in both the plasma and red blood cell volume; the heart is enlarged, the cardiac output is increased, but the arterial oxygen saturation is normal, and there is no cyanosis or clubbing of the fingers.

Differential Diagnosis. Polycythemia vera must be ruled out. At times, patients with polycythemia vera develop transient circular infiltrations in the lungs. Angiocardiograms will generally distinguish these infiltrations from a true pulmonary arteriovenous fistula. Congenital heart disease may be confused with pulmonary fistulas. Ordinarily physical examination or other diagnostic measures will demonstrate a cardiac abnormality in the patient with congenital cardiac disease. Aneurysms of the pulmonary artery are rare lesions which may be confused with pulmonary fistulas, if the x-ray alone is relied upon for diagnosis. There would be no shunt permitting venous blood to reach the systemic circulation in a patient with a pulmonary artery aneurysm, and hence no cyanosis.

Prognosis. Hemorrhage from ruptured pulmonary fistula may be severe enough to be lethal; thrombosis being another cause of a fatal termination. Consequently pulmonary arteriovenous aneurysms should be treated surgically. However, since in many cases the fistulas are multiple, it is very important to conserve as much lung tissue as possible in operating upon patients with lung fistulas.

CASE REPORTS

Case 1. History. A 16 year old boy dependant, son of an army officer, entered the Walter Reed General Hospital in October 1945 because a "machinery" murmur was heard over the left chest posteriorly during a physical examination for admission to West Point. No member of his family was known to have either congenital telangiectases or undiagnosed pulmonary disease. X-ray examination of his chest revealed increased pulmonary vascular markings on the left side (fig. 1). An angiocardigram demonstrated a pulmonary arteriovenous aneurysm in the left lower lobe (fig. 2). Another aneurysm located in the right lower lobe was almost missed because the x-ray label partially obscured the fistula. A left lower lobe lobectomy was performed (Dr. Blades) on October 17, 1945. The patient made an uneventful recovery and left the hospital in November 1945. He enlisted in the army and was assigned to the paratroopers in 1948. He made 10 paratroop jumps without difficulty. In December 1948 he was called back to the hospital for re-evaluation of the remaining pulmonary fistula.

In his past personal history he disclosed the fact that he had had a bone cyst in his left humerus packed with bone chips taken from his right ilium in 1942; the cyst healed uneventfully.


Examination. The patient was a very well developed, well nourished white male, 20 years of age. The skin revealed no cyanosis and no telangiectases. There was a well healed left thoracotomy scar. Breath sounds were normal, and no bruits were heard in the lungs. The heart was within normal limits. The blood pressure was 138 systolic and 88 diastolic. There was a long scar over the left humerus, and another over the right ilium. 



FIG. 1. (Case 1.) Chest film, P. A., before first operation

Laboratory data. The hemoglobin was 17 Gm., the oxygen content of the arterial blood was 21.1 volumes per cent, and the oxygen capacity of the arterial blood was 23.5 volumes per cent. The arterial oxygen saturation was 88.6 per cent. Angiocardiograms showed an arteriovenous aneurysm in the posterior part of the right lower lobe (fig. 3). Blood counts, urinalysis, and serology were within normal limits. The vital capacity was 4.6 liters.

Operation. On March 1, 1949, the aneurysm was removed by Dr. Blades, by a wedge resection of a portion of the right lower lobe posteriorly. Pathological examination of the specimen disclosed a vascular ectasia consistent with the diagnosis of arteriovenous fistula.

Postoperative Course. The patient passed through an uneventful convalescence. Six weeks later his arterial oxygen saturation was 92.5 per cent and the vital capacity was 3.6 liters. He subsequently returned to active duty and is now a commissioned officer.

Case 2. History. A private of the U. S. A. army entered the Walter Reed General Hospital on October 19, 1949, complaining of headache, nosebleeds, dyspnea, and fatigue for the preceding 3 months.

He was well until 3 months before admission, having gone through his basic training without difficulty. He then began to feel weak and tired, began to have at least one nosebleed daily and red spots appeared on his lips. Dyspnea and fatiguability developed to the point where he lost consciousness 2 or 3 times weekly; he had also become mentally confused.



FIG. 2. (Case 1.) Angiocardiogram, before first operation. Fistula left lower lobe; there is also a fistula in the right lower lobe obscured by the label.

Family History. He was one of 11 siblings. Three brothers died within a day or two of birth. Eight brothers and sisters were alive; of these, 4 sisters had cutaneous spots, 1 sister had frequent nosebleeds, 1 brother had cutaneous spots and 1 brother had been ill since birth with obscure symptoms. His great-grandmother and grandmother had both cutaneous spots and frequent nosebleeds. Four aunts and uncles had similar complaints. An uncle and an aunt died when very young. Another uncle was chronically ill. Twenty-four cousins had either frequent nosebleeds or cutaneous spots. One cousin had complaints very similar to the patient's and also had x-ray evidence of a pulmonary lesion.

Examination. The patient was a small, thin, white male who was apathetic and slightly cyanotic. The cyanosis became much more marked after exercise. There were numerous petechiae on the lower lip. A loud machinery murmur was heard anteriorly in the 4th inter-space about 7 cm. to the left of the sternum. The heart was not enlarged to percussion; pulse rate, 84. The heart sounds, except for the machinery murmur, were normal.

Laboratory data. The red blood cell count was 5.5 million; hemoglobin 16 Gm. per cent; the white blood cells numbered 5,350; coagulation time, 7 minutes, and the bleeding time, 2



FIG. 3. (Case 1.) Angiocardiogram, before second operation. Fistula in left lower lobe removed by lobectomy. Fistula in right lower lobe still present.

minutes. The urinalysis was normal. Nine blood cultures were sterile. The blood urea nitrogen was 14.5 Gm. per cent, the arterial oxygen saturation 88.6 per cent and the venous oxygen saturation, 49.3 per cent. X-ray examination of the chest showed a comma shaped shadow in the right hilum and vascular abnormalities in the midportion of the left lung field. Angiocardiograms showed pulmonary arteriovenous aneurysms in the lingular portion of the left upper and left lower; the right middle and the right lower lobes.

Operation. On December 9, 1948 Dr. Blades performed a left lower lobectomy and a wedge resection of the lingula. The patient passed through an uneventful convalescence. Subsequently, angiocardiograms showed no remaining aneurysms in the left lung but again disclosed aneurysms in the right middle and right lower lobes. The arterial oxygen saturation was 91.5 per cent before exercise and 95.5 per cent after exercise.

On March 17, 1949 the patient was subjected to a second operation (Dr. Blades) and a large aneurysm was found in the right middle lobe. It was removed by a wedge resection of the entire lobe. There seemed to be a small fistula deep within the right lower lobe. This was left untouched as it was felt that a lobectomy would have been necessary to ensure its removal. It was felt to be unwise to sacrifice so much lung tissue in a patient who might later have additional aneurysms in other parts of the lung. Except for some troublesome nosebleeds and bleeding from the petechiae on his lips he was doing quite well. He was no longer cyanotic and felt much improved. Three months after the operation his vital capacity was 74 per cent of normal and he returned to active duty.



FIG. 4. (Case 3.) Chest film, P. A., before first operation. Comma shaped fistula visible in right lung hilum.

Case 3. History. A 20 year old white male was admitted to the Walter Reed General Hospital on August 31, 1949, for evaluation of a shadow seen in the right lower lobe on a routine chest film (fig. 4). Since the age of 6 years he had had episodes of severe headache preceded by transient left visual defects.

The patient's mother had clubbing of fingers without respiratory symptoms. No other members of his family had any symptoms pointing to possible pulmonary aneurysms.

Past History. The patient had had a chronic discharge from his left ear since the age of 8. He had hepatitis at 9, pneumonia at 13, and dyspnea on moderate exertion since the latter disease.

Examination. The patient was a well developed, alert male in no distress. His skin was slightly cyanotic but without telangiectases. The left ear drum was fibrotic. All the upper

teeth were absent. A faint machinery-like murmur was heard over the right lower chest. There was moderate clubbing of all the fingers.

Laboratory data. The red blood cell count was 5.9 million, and the hemoglobin 16.7 Gm. per cent. The urine and cerebrospinal fluid examinations and electroencephalogram were normal. The vital capacity was 4.2 liters.

Course. The patient was treated in the Allergy Clinic with antispasmodic drugs and histamine desensitization in an effort to relieve the severe headaches. Angiocardiograms showed that the mass in the right lower lobe was an aneurysm (fig. 5). On December 1, 1949 Dr. Blades resected the right lower lobe. The patient convalesced uneventfully and ten weeks after operation his vital capacity was 3.2 liters; he soon returned to active duty.



FIG. 5. (Case 3.) Angiocardiogram, fistula in right middle lobe is visible

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AN EVALUATION OF A FRACTIONAL INTRAVENOUS SODIUM BENZOATE TEST FOR LIVER FUNCTION*

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Determination of hippuric acid synthesis by the liver in man was first used by Quick as one of the indices of parenchymatous liver disease (1, 2). That this test compares favorably with any of the other commonly utilized liver function tests has been repeatedly demonstrated in the past (3, 4). The intravenous modification of the oral hippuric acid test, as also first outlined by Quick, et al. (5), possesses the advantages of (a) ease of administration of the test substance, (b) absence of side effects such as nausea, vomiting, or gastric distress which are common with the oral route of administration, (c) reduction in the time necessary for the test period, and (d) a high index of correlation with the oral test. It was established that normal subjects excreted 1.0-1.4 Gm. of hippuric acid during the one-hour interval, following the intravenous administration of 1.77 Gm. of sodium benzoate. Patients with liver damage excreted smaller amounts of hippuric acid during this period of time.

The purpose of this communication is to describe the results obtained by altering the standard form of the test, so that instead of determining the hippuric acid output for only one hour after the administration of sodium benzoate, the test was prolonged for an additional hour, and the hippuric acid in each hourly specimen was determined separately. In addition, the excretion of glucuronates in each specimen was also measured. This was done in both normal persons and in patients with various types of liver disease.

METHOD

1.77 Gm. of sodium benzoate (equivalent to 1.5 Gm. of benzoic acid), dissolved in 20 cc. of distilled water, were administered slowly via the intravenous route. Prior to this, the fasting patient had voided completely, or if this were impossible, he was catheterized and the catheter made indwelling. To insure an adequate urinary output, 400 cc. of water were given orally at the onset of the test, and an additional 200 cc. at the end of the first hour. The entire urinary volume was collected at exactly one and two hours after the intravenous injection. The amount of hippuric acid contained in these specimens was determined by the method described by Quick (6), utilizing the "salting out" of hippuric acid by ammonium sulphate in an acid medium. Results were expressed as grams of hippuric acid per hour. The glucuronate excretion was measured by the naphthoresorcinol reaction, as modified by Snapper and Saltzman (9). The results were expressed as either negative (-), weakly positive (\pm), moderately positive (+), or strongly positive (++) .

OBSERVATIONS

In Table I are listed the results, obtained from 18 normal subjects (young hospital personnel). The hippuric acid excretion figures for the one hour specimens closely parallel those given by others (4, 5). The low values obtained in cases 8 and 17 are unexplained, inasmuch as no evidence of liver disease was found in these individuals, either clinically or by other tests. The values obtained

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TABLE I
Excretion of Hippuric Acid and Benzoyl Glucuronate in Normal Subjects

SUBJECT	GRAMS OF HIPPURIC ACID		GLUCURONATE EXCRETION	
	1st hour	2nd hour	1st hour	2nd hour
1	1.40	0.63	±	—
2	1.16	0.33	—	—
3	1.59	0.54	±	—
4	1.25	0.54	—	—
5	1.02	0.36	±	—
6	1.04	0.55	±	—
7	0.91	0.21	—	—
8	0.78	0.71	±	—
9	1.59	0.29	—	—
10	1.60	0.91	—	—
11	1.18	0.59	—	—
12	1.41	0.62	—	—
13	1.17	0.63	—	—
14	1.48	0.28	—	—
15	1.14	0.77	—	—
16	1.32	0.67	—	—
17	0.88	0.75	—	—
18	1.16	0.89	—	—

TABLE II
Excretion of Hippuric Acid and Benzoyl Glucuronate in Patients with Liver Disease

SUBJECT	DIAGNOSIS	GRAMS OF HIPPURIC ACID		GLUCURONATE EXCRETION	
		1st hour	2nd hour	1st hour	2nd hour
1	Hepatitis	0.95	0.90	++	+
2a	Hepatitis	0.38	0.41	+	++
2b	Hepatitis (2 weeks after a)	0.96	0.72	+	—
3a	Hepatitis	0.50	0.35	+	++
3b	Hepatitis (1 week after a)	0.99	0.53	+	—
3c	Hepatitis (1 week after b)	1.36	0.46	+	—
4	Hepatitis	0.54	0.82	++	++
5	Hepatitis	0.62	1.53	++	++
6	Cirrhosis	0.82	0.92	++	+
7	Cirrhosis	0.49	0.50	+	+
8	Cirrhosis	1.01	0.96	±	+
9	Cirrhosis	0.47	1.08	±	+
10	Cirrhosis	0.50	0.36	++	—
11	Cirrhosis	0.39	0.43	++	+
12	Biliary cirrhosis	0.78	0.69	+	+
13	Acute cholangitis	0.50	1.12	—	++
14	Hepatoma	0.64	0.67	—	—
15	Hepatic fibrosis with prolonged congestive failure	0.49	1.24	+	+

during the second hour are, in every case, lower than those found in the first hour, and their range is considerable. The amount of glucuronates, excreted by these normal subjects during the first hour, is negligible, and in the second hourly period is negative, by the method of determination used, in every instance.

Table II lists the results obtained in patients with known dysfunction of the liver parenchyma (hepatitis, cirrhosis, cholangitis, hepatoma). The output of hippuric acid during the first hour is significantly lower than that of normal persons, and, as is shown in cases 2 and 3, increases proportionately to the degree of liver regeneration. As in the normals, there is a wide range of values obtained in the second hour specimens, but in these cases, more often than not, the output during the second hour exceeds that of the first hour. Table II also reveals that in these patients with disorders of the liver, the excretion of benzoyl glucuronate is markedly increased as compared to the normal. In nearly all of the cases significant amounts of glucuronate are excreted in both specimens. Cases 2 and 3 demonstrate that as liver function improves, glucuronate conjugation decreases.

DISCUSSION

The sodium benzoate test has been used as an index of parenchymatous liver function since 1932. The test is based on the fact that in humans benzoic acid is conjugated with glycine in the liver to form hippuric acid, which is subsequently excreted *via* the kidneys. Thus, the amount of hippuric acid, formed by any individual given a sufficient amount of benzoic acid, is limited by the ability of the liver cells to synthesize glycine. Feeding glycine together with benzoic acid will increase the amount of hippuric acid excreted above the previous maximum value obtained when benzoic acid is given alone (2).

It has been shown (7-12) that in the presence of liver disease, this detoxification process is frequently impaired, and that at such times, a supplementary conjugation system is utilized. By this mechanism, the undetoxified and unbound benzoic acid is conjugated with glucuronic acid, and excreted in the urine as the benzoyl salt of glucuronic acid. Thus, it would be expected that at times when the hippuric acid output is below normal, the glucuronate excretion would rise. That this presumption generally holds true has been clearly shown in the past and, in fact, forms the basis for the oral benzoic acid and cinnamic acid liver function tests as described by Snapper (7-12). In these latter tests, what is measured is not the decreased excretion of hippuric acid, but the increased production of benzoyl glucuronate, and this increase, if found, indicates parenchymatous liver disease.

It must be borne in mind, however, that even this glucuronate detoxifying reaction is but another one of the numerous functions of the liver cell. Consequently, severe liver damage may result in a diminution in the production of both hippuric acid and benzoyl glucuronate. This explains why in certain cases (Table II, Cases 2a, 7, 9, 13, 15) in which the hippuric acid excretion is especially low, the benzoyl glucuronate output is not necessarily very high. In these patients, there is an increased production of the glucuronates, when compared

to normal individuals, but it is not of the magnitude one would expect from the decrease in the amount of hippuric acid synthesized.

Quick, in his publications, arbitrarily decided upon a one-hour test period, and stated that the maximal rate of hippuric acid synthesis in any given individual is constant (1, 6). This is probably true in normal subjects. However, our results—as shown by more than half the cases in Table II—demonstrate, that in some patients with liver disease, even though the supply of benzoic acid in the blood stream is at its highest level, the amount of hippuric acid synthesized at that time is not maximal, but may be much higher at a later period of time, i.e., in the second hourly period. This would not obtain were Quick's hypothesis applicable to abnormal livers.

One possible explanation for this phenomenon—the increased production of hippuric acid at a time when the blood level of benzoic acid is falling—probably depends on the fact that, as already stated, benzoic acid is detoxified by two separate, but supplementary methods. Thus, we postulate, that in certain patients with liver dysfunction the maximal rate of hippuric acid synthesis is not constant, but is low initially, being supplemented by the glucuronate conjugation. Later, as it gains in efficiency, the rate of hippuric acid synthesis increases and the glucuronate production decreases.

It has been suggested that it would be more accurate to use a two-hour intravenous test rather than the one-hour test as originally described by Quick (13). Several of our cases (Table II, cases 4, 5, 6, 9, 12, 13, 14, 15) had definitely abnormal tests, as determined by the one-hour output of hippuric acid, but produced equal and usually greater amounts of hippuric acid during the second hour, so that the total production of hippuric acid in two hours was well within the normal range. It is, therefore, obvious that a total two-hour test without fractional determinations is an inaccurate appraisal of liver function.

SUMMARY

The urinary excretion of hippuric acid and benzoyl glucuronate following the intravenous injection of 1.77 Gm. of sodium benzoate in normal subjects and patients with liver dysfunction has been determined at hourly intervals for two hours.

Normal subjects excrete much more hippuric acid during the first hour than during the second, and the absolute value for the one hour excretion usually exceeds 1 Gm. No significant amount of benzoyl glucuronate is excreted by normals.

In patients with liver disease, the one-hour excretion of hippuric acid is diminished, depending on the degree of impairment of the detoxifying mechanism. In some cases, a much higher excretion of hippuric acid is found during the second hour than during the first, and in these cases, the total two-hour excretion of hippuric acid is similar to that of normal subjects.

In the presence of liver damage, increased amounts of glucuronate are found in the urine. As liver function improves, more hippuric acid and less glucuronate are excreted.

Liver damage may be said to be present when, during the first hour after the intravenous injection of 1.77 Gm. of sodium benzoate, less than 1.0 Gm. of hippuric acid is excreted; or, when either the first and/or the second hour specimens show positive glucuronate reactions.

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SPATIAL VECTORCARDIOGRAPHY: WIDE QRS COMPLEXES WITH SHORT P-R INTERVAL (THE WOLFF-PARKINSON- WHITE SYNDROME)*

A. GRISHMAN, M.D. AND H. L. JAFFE, M.D.

Various explanations have been invoked for the occurrence of electrocardiograms with wide QRS complexes and short P-R intervals, the so-called Wolff-Parkinson-White syndrome. In a study of patients with such an electrocardiogram by means of intracardiac, esophageal, and conventional leads (1) the following observations were made on the pathway of the excitation wave:

- 1) The pace maker is the sino-atrial node;
- 2) The sinus impulse is not conducted through the atrio-ventricular node or the bundle of His and its branches;
- 3) Conduction of the impulse from the atria to both ventricles is by way of a slow conduction medium (accessory or rudimentary muscle fibers) and is indicated in the electrocardiogram by a slurring at the beginning of the R wave called the Delta wave (2);
- 4) This accessory conduction system transmits the excitation wave simultaneously to the lateral surface of the right ventricle and the postero-medial surface of the left ventricle. The pathway of conduction is probably along the atrio-ventricular groove, the width of the excitation wave front varying from patient to patient;
- 5) In the right ventricle the excitation wave spreads from the epicardium toward the endocardium.

When conduction occurs normally, the instantaneous balance of forces is contributed to by muscle portions stimulated simultaneously in both ventricles and by the anterior-posterior and superior-inferior segments in each ventricle. This normal sequence of discharge of electromotive forces can be visualized by means of spatial vectorcardiography (3). The projection of the normal vectorcardiogram along preselected lines results in a normal electrocardiogram, including the standard, unipolar extremity and chest, esophageal, and intracardiac leads.

In patients with Wolff-Parkinson-White syndrome the normal pathway for the spread of the excitation wave is not utilized; therefore, the instantaneous balance of forces is produced differently from that in the normal. Instead of components from both ventricles, a wave front is initiated in the atrio-ventricular groove posteriorly and right laterally and progresses in a left anterior or lateral direction, or infrequently, to the left posterior. It may also be directed superiorly or inferiorly, depending partly on the position, size, and configuration of the heart. Since there is no balance of right and left ventricular electromotive forces in Wolff-Parkinson-White syndrome, it is impossible to determine whether or not chamber hypertrophy is present. Similarly, it is very difficult, or impossible, to detect myocardial infarction since there is no balance of forces between

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those generated by the anterior and posterior surfaces or by the diaphragmatic and superior portions of the heart.

MATERIAL AND METHOD

Spatial vectorcardiograms have been recorded in nine persons with Wolff-Parkinson-White syndrome by the technique previously described (3). The vectorcardiograms and electrocardiograms in four of these cases are presented



FIG. 1A. Spatial vectorcardiogram of an individual without heart disease. Note the marked slowing of the onset of the centrifugal loop.

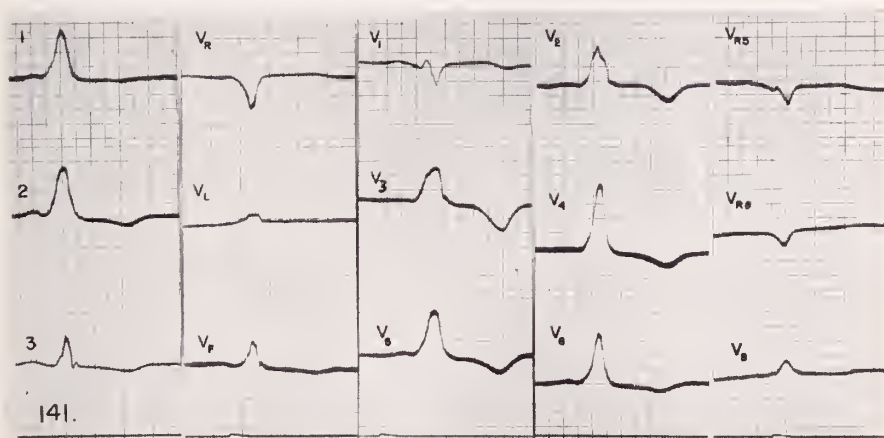


FIG. 1B. The electrocardiogram (10 cm./sec., i.e. four times normal speed) shows the characteristic features of the Wolff-Parkinson-White conduction: short P-R interval, long QRS complexes and discordant T waves.

in this report. The appearance of the normal spatial vectorcardiogram, its relation to unipolar and bipolar electrocardiograms and the changes produced by myocardial infarction, conduction defects and chamber hypertrophy have been discussed in previous papers (4-8). The Technicon Cardiograph and Vectorscope have been used throughout.

OBSERVATIONS

In Figures 1A and 2A are presented the vectorcardiograms of two normal patients with Wolff-Parkinson-White syndrome (*cases 1 and 2*). In Figure 1A, the vector loop is directed toward the left posterior lower octant, forming a



FIG. 2A. Spatial vectorcardiogram of an individual without heart disease. The QRS loop is oriented in the left anterior upper octant. Note the slow progression of the centrifugal loop, best seen in the sagittal projection. The T loop again is discordant.

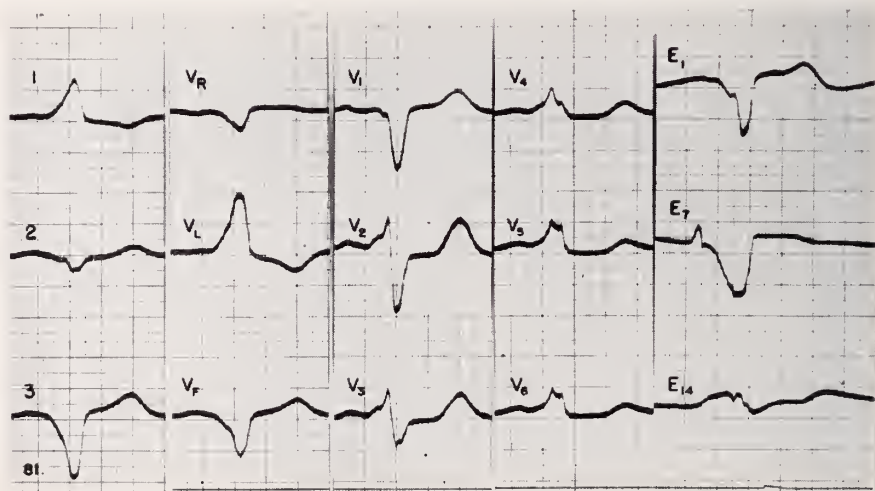


FIG. 2B. The electrocardiogram (10 cm./sec.) correlates well with the spatial vectorcardiogram, showing characteristic delta waves in all leads. The configuration of the esophageal leads is due to the anterior and superior orientation of the sagittal projection

figure eight in the frontal and sagittal planes, and running counterclockwise in the horizontal projection. The centrifugal portion of the loop is very closely spaced in all three projections. In normal persons, on the contrary, the initial segment of the loop, i.e., the septal vector, in the horizontal projection is directed

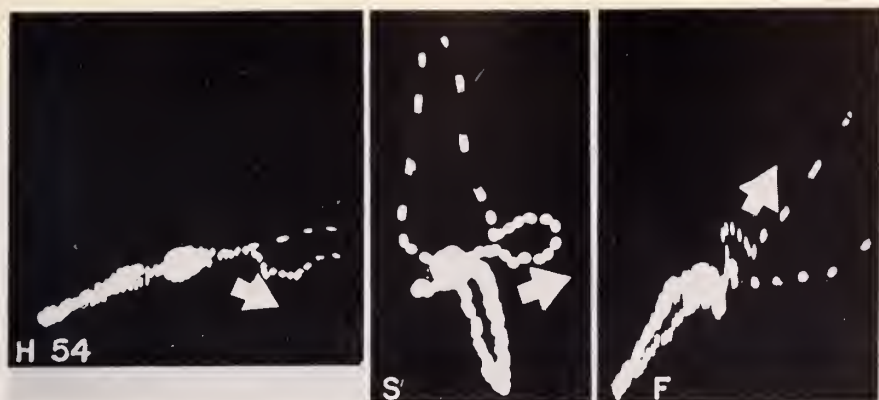


FIG. 3A. Spatial vectorcardiogram of patient showing evidence of anterior wall infarction when normal condition prevails. Note the conspicuous delta loop.

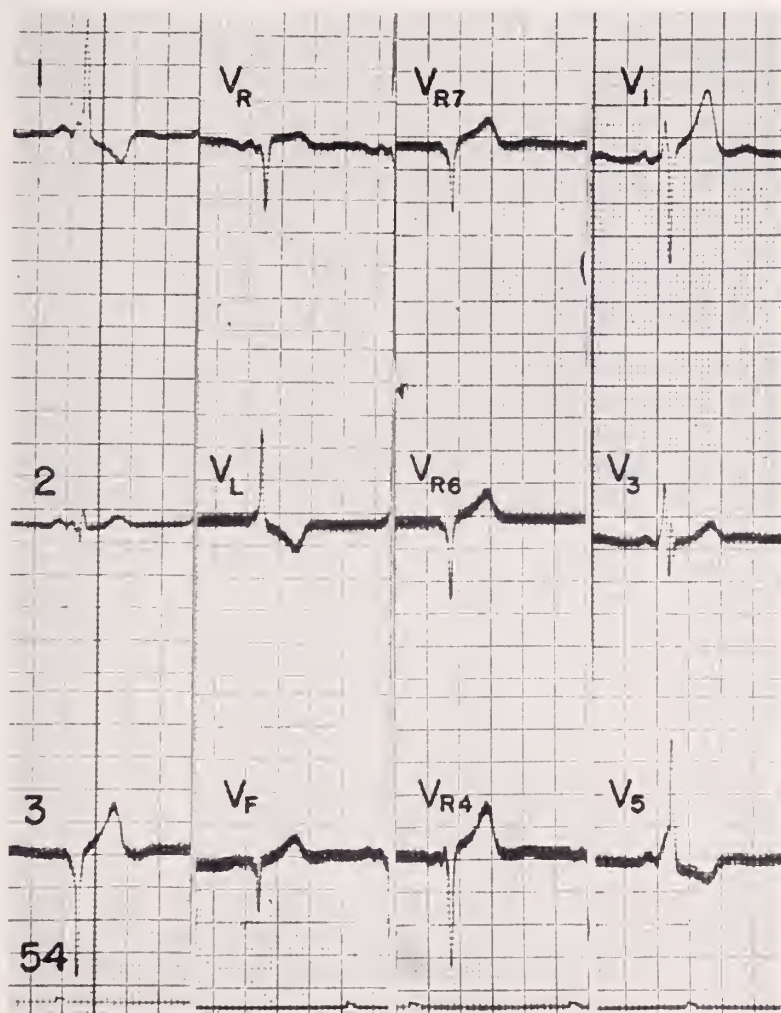


FIG. 3B. The electrocardiogram does not differ from those obtained in patients without heart disease.

to the right anteriorly. In Wolff-Parkinson-White syndrome, this portion of the loop is directed to the left either anteriorly or posteriorly, and the time markings are spaced very closely. This initial, slow segment corresponds to the Delta wave in the electrocardiogram (1). The T loop is discordant to the QRS loop.

In Figure 2A, the vector loop is located in the left anterior upper octant. As in Figure 1A, the initial portion of the centrifugal loop is closely spaced and the direction of the T loop is discordant.

Figure 3A shows the spatial vectorcardiogram in Case 3, a 48 year old man, whose electrocardiogram showed intermittent, normal, or Wolff-Parkinson-White conduction. Six weeks prior to the recording of the vectorcardiogram he devel-



FIG. 4A. Spatial vectorcardiogram of patient with isolated pulmonic stenosis and marked right ventricular hypertrophy and enlargement. The cardiac vector is predominantly oriented in the left anterior, inferior octant.

oped an anterior wall infarction which was evidenced by large Q waves in V_1 to V_4 during periods of normal conduction. The vector loop is located in the left posterior octant and the "delta loop" is distinctly separated from the remainder of the QRS loop and shows close spacing of the time markings.. The T loop is discordant to the QRS loop. Such a vectorcardiogram may be seen in patients without organic heart disease and thus it is impossible to make a diagnosis of myocardial infarction unless the relationship of the integrated QRS to T vector is determined.

Figure 4A shows the spatial vectorcardiogram in Case 4, a 17 year old boy with an isolated pulmonic stenosis and frequent attacks of paroxysmal tachycardia. The loop is located in the left lower anterior octant, figure eight in configuration in the frontal, and counterclockwise directed in the sagittal projection. The initial segment (centrifugal loop) reveals a close spacing of the

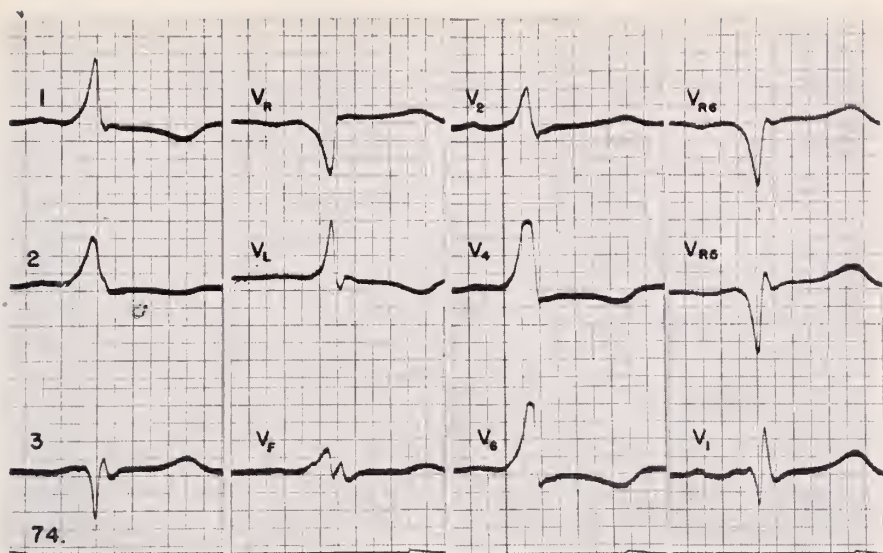


FIG. 4B. The electrocardiogram (10 cm./sec.) does not differ from those obtained in patients without chamber enlargement.

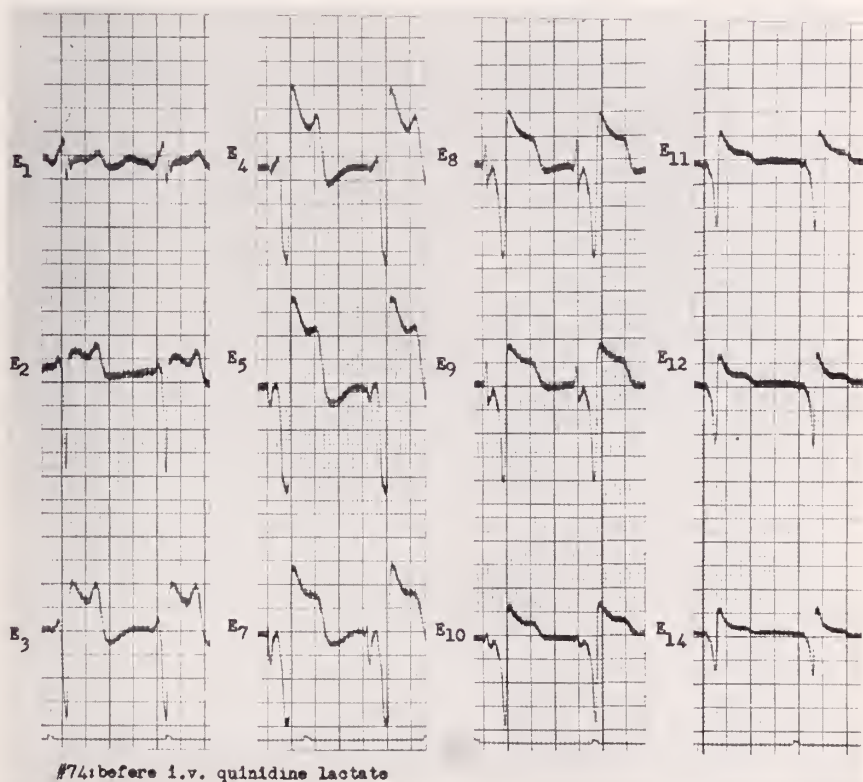


FIG. 4C. The configuration of the esophageal leads is well explained by the orientation and configuration of the sagittal projection.

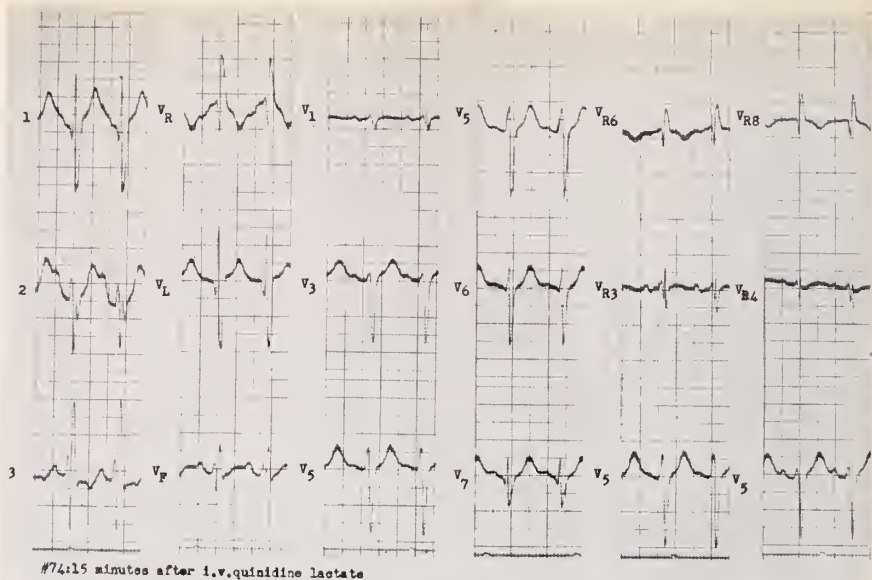


FIG. 4D. Quinidine lactate, given intravenously, resulted in normal conduction. Evidence of marked right ventricular hypertrophy is now demonstrable.

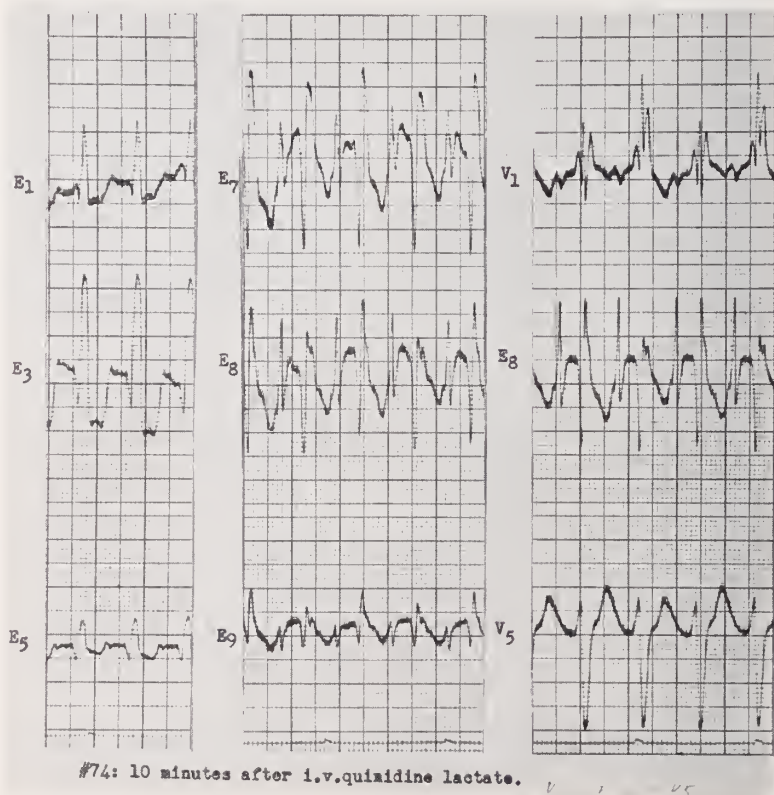


FIG. 4E. Esophageal leads taken at that time yield further proof of normal conduction. Negatively oriented delta waves are no longer seen in esophageal leads at atrial level. Alternation of QRS complexes can be seen.

time markers. The RT and T vector are directed right laterally. The electrocardiogram shows the typical features of a Wolff-Parkinson-White electrocardiogram with short PR interval, wide QRS complexes and left axis deviation. Esophageal leads correspond well to the sagittal projection of the spatial vectorcardiogram. Only E_1 located below the diaphragm, reveals an initial positivity. All remaining leads are negative.

0.65 Gm. of Quinidine Lactate (Eli Lilly) were given intravenously in order to suppress conduction through accessory pathways and thereby reestablish a normal spread of the excitation wave. The change to normal conduction took place before completion of the injection within eighty seconds. The electrocardiogram recorded fifteen minutes later revealed an electrocardiogram indicative of marked right ventricular hypertrophy. The esophageal leads (fig. 4E), taken five minutes earlier, revealed disappearance of delta-waves and suggest an entirely different spatial orientation of the cardiac vector. An electrical alternans of the QRS complexes was present.

DISCUSSION

The evidence provided by spatial vectorcardiography supports the opinion previously published that in Wolff-Parkinson-White syndrome the excitation wave spreads to both ventricles along accessory pathways (1). Consequently, there is a wave front accession of the electromotive forces without instantaneous balance of the forces of the right and left ventricles, of the anterior and posterior walls or across the septum. This wave front, arising at the right posterior portion of the atrio-ventricular groove, progresses to the left anteriorly, laterally or slightly posteriorly and in a superior or inferior direction. This conduction pathway precludes the diagnosis of anterior or diaphragmatic infarction since the development of an abnormal "infarction vector" depends upon a lack of balance of forces between the infarcted areas and the wall opposite (5). Although the position and configuration of the vector loop are doubtless affected by the inability of the infarcted muscle to generate electrical forces, our present knowledge is inadequate to detect and separate such variations from those occurring in normal people. Similarly, because of the absence of instantaneous balance of right and left ventricles in the Wolff-Parkinson-White syndrome, enlargement of either ventricle cannot be detected. Rotation and cardiac enlargement unquestionably alter the position and configuration of the vector loop but the changes are difficult to distinguish from normal variations.

Our observations do not support the idea of Segers and his associates (2) and Vastesaeger and associates (9) that the delta wave represents merely the summation of a normal electro- or vectorcardiogram and the delta wave. The latter is thought to be the action current of the accessory bundle. We agree with Duchosal and Sulzer (10) that in Wolff-Parkinson-White conduction the vectorcardiographic pattern is basically different from that present in normal conduction as their published cases demonstrate. Donzelot and associates (11) have presented vectorcardiograms of Wolff-Parkinson-White syndrome without any discussion.

The vectorcardiographic observations in the Wolff-Parkinson-White syndrome adequately explain the findings in esophageal and intracardiac leads. A QS is present over the major portion of the esophagus because the QRS vector loop is usually oriented to the left, anteriorly or laterally. An R wave is obtained within the right ventricular cavity since the electromotive "wave front" begins on the epicardial surface of the right posterior atrio-ventricular groove, the right ventricular cavity being situated in its pathway ("approaching wave").

SUMMARY

Nine patients with Wolff-Parkinson-White syndrome have been studied by means of spatial vectorcardiography and the records of four patients are presented and discussed. They demonstrate the difficulty in diagnosing myocardial infarction and chamber enlargement in this syndrome because of the peculiar pathway of the excitation wave.

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ENORMOUS IDIOPATHIC VESICAL HEMORRHAGE*

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Hematuria is a cardinal symptom demanding complete investigation of the entire urinary tract. It may vary in degree from occult blood, detected only by microscopic examination, to severe hemorrhage with passage of large blood clots, or even to complete urinary retention caused by mechanical obstruction of the clots. The accessibility of the urinary system to direct observation with the cystoscope, combined with the excellent diagnostic information afforded by excretory and retrograde pyelography, make for a high degree of accuracy in seeking the etiology of hematuria.

Cahill, in 1942, made a critical analysis of the causes of hematuria among 14,000 admissions to the Squier Clinic, and concluded that a causative lesion was found in 96 per cent of the cases. He classified the etiological factors in three major categories: 1. Hematuria in general diseases; 2. Hematuria of renal, ureteral, vesical, or urethral origins; and 3. Hematuria from diseases directly invading the urinary tract.

Although the remaining 4 per cent may be grouped as cases of "essential hematuria," he as most urologists, believes reservation must be maintained as to the infallibility of this diagnosis, since in numerous instances, repetition of urinary tract investigations may ultimately reveal lesions undetected at the initial examination.

It is somewhat unusual to be able to identify the bladder as the focus for hematuria, to visualize the lesions both with the cystoscope and the unaided eye, to have biopsies of the lesion, and still to be ignorant of the cause of massive vesical hemorrhage. Vesical bleeding is commonly due to trauma, calculus, or foreign body, infections, tumors, parasites such as *Bilharzia*, epithelial changes such as leucoplakia, or congenital malformations. All these conditions are readily detected by the usual means employed for studying the urinary tract.

The case to be presented manifested massive vesical hemorrhage, and required cystotomy for hemostasis. Although the patient recuperated satisfactorily, the exact etiology of his bleeding was not ascertained. This somewhat unusual situation and the manner in which the bleeding was handled, make the problem worthy of presentation.

CASE REPORT

History. The patient, H. B. adm. 600163, a man aged 64 years, was admitted on 8-11-49 to the Mt. Sinai Hospital because of profuse gross total painful hematuria.

Four days prior to admission he had observed diarrhea, unaccompanied by any other symptoms, lasting for two days.

Three days before admission he noted gross hematuria with passage of clots and painful frequent urination. On the second day of his hematuria, he was examined by a urologist who found a few bleeding points within the patient's bladder and clear urine effluxing

* From the Urologic Service of the Mount Sinai Hospital. Presented at the Monthly Urologic Conference of Dr. Gordon D. Oppenheimer on October 25, 1949.

from each ureteral orifice. The areas of bleeding were fulgurated, but no lasting control of bleeding was achieved. Passage of bloody urine with clots continued and the patient became progressively weaker, necessitating hospitalization.

Systemic review was non-contributory, the patient having enjoyed good health until the onset of his present illness.

Examination. On admission the patient appeared to be in moderate distress with a pallor of the skin and mucous membranes. His blood pressure was 110 systolic and 60 diastolic, the pulse was 88/min. with a regular sinus rhythm. The lungs were clear. His heart sounds were normal and of good quality. The abdomen and external genitalia were normal. Rectal examination revealed the prostate to be benign in consistency and normal in size. The extremities and reflexes were normal.

Laboratory findings: Hemoglobin, 6 Gm; Erythrocyte sedimentation rate, 2 mm/hr; Blood Urea Nitrogen, 12 mg%. A preliminary film of the abdomen was negative; an electrocardiogram was normal; bedside chest X-ray showed an old tuberculous process in the left upper lobe, and one at the right lung base. There was left ventricular enlargement.

Course: The patient was immediately on admission transfused with 1000 cc. blood. Attempts were made to render his bladder free of blood clots by aspiration through a catheter, but recognition of the failure of this maneuver made cystoscopic examination imperative.

Prior to the cystoscopic examination on 8-12-50, the patient had received 2500 cc. blood, which had raised his hemoglobin level to 9.1 Gm. Under spinal anesthesia, an exceedingly large amount of blood clot was evacuated from the bladder. Inspection of the posterior urethra and bladder was carried out, using a panendoscope and Brown-Buerger cystoscope. The posterior urethra was found normal. The posterior wall of the bladder was found to be inflamed with areas of musculature exposed. No neoplasm was seen, nor could any individual bleeding points be identified. Again efflux of clear urine was visualized from each ureter. A three way Alcock catheter was left indwelling in the bladder and continuous bladder irrigation with sterile distilled water begun.

During the next few hours the patient received an additional 1500 cc. blood, but a significant blood loss continued. It was recognized that the patient's bladder again was distended to the level of his umbilicus with blood clots and cystotomy for control of the hemorrhage became necessary.

On 8-12-49, at 4:30 P.M., exploration was performed under nitrous oxide and intravenous sodium pentothal anesthesia. The patient's blood pressure at the outset of the operation was 80 systolic and 40 diastolic, but this rose to 108 systolic and 52 diastolic at the completion of the procedure.

Through a transverse suprapubic incision, the anterior rectus sheath was incised, the muscles retracted, and the peritoneum reflected cephalad. This exposed a bladder, bluish in color, and distended to the size of a six months gestation. Upon incision the bladder wall was found markedly attenuated. After removal of about 2000 cc. of blood clots from the bladder, it was evident that the trigone and posterior inferior bladder wall were denuded of mucosa, exposing large areas of muscularis which were bleeding profusely. There was no gross evidence of gangrene of the bladder to explain the loss of mucosa over such large areas. Clear urine could be seen effluxing from both ureteral orifices. Fulguration was attempted but found inadequate in controlling the bleeding. A #8 Fr. ureteral catheter was passed to each renal pelvis to provide adequate urinary drainage, strips of Gelfoam soaked in topical thrombin were placed over the bleeding bladder surfaces, and the bladder was packed tightly with three gauze packings. This procedure effectively controlled the bleeding. The ureteral catheters and the packings were brought out the suprapubic wound and the bladder closed around them with interrupted chromic sutures. The rectus fascia was reapproximated with chromic sutures and the skin closed with interrupted silk sutures. During the operation the patient received another 500 cc. blood transfusion.

The following day it was observed that the bleeding had stopped. The ureteral catheters were draining well, although the suprapubic dressings were wet.

Hematological investigation (8-15-49) revealed no abnormalities: Bleeding time, $2\frac{1}{2}$

min.; clotting time, 9 min.; Hemoglobin, 11 Gm; red blood cells, 4.3 million/cc; white blood cells, 16,000 (Polys: non seg., 12; seg., 72; Bas., 1; Lympho., 8; Mono., 7; Retic., 0.6%; Platelets, 180,000/cc. On smear, the platelets appeared a low normal. The red blood corpuscles showed polychromatophilia, macrocytosis, and anisocytosis. The white blood corpuscles showed a shift with occasional myelocyte on the smear. The prothrombin time was 15.5 sec. with the control 12 sec.

Microscopic examination of the blood clot removed from the bladder at operation was negative for tumor cells, and culture of the clot revealed *Staphylococcus Aureus* and *B. Chromogenes*.

Post-operatively the patient received 300,000 units of procaine penicillin intramuscularly daily, aureomycin 250 mg. every 6 hours, and dihydro-streptomycin 0.5 Gm. every six hours. His course was uneventful and without further bleeding.

On 8-19-49, the seventh post-operative day, the packings were removed from the bladder under spinal anesthesia. No bleeding was encountered. A #28 Fr. Malecot catheter was placed in the bladder for suprapubic drainage and the wound closed about it.

The subsequent course remained uneventful, with clear urine draining from the suprapubic tube. On the fourteenth post-operative day, an intravenous pyelogram was performed, revealing very slight increase in caliber in the collecting system on both sides. This was especially true of the lower ureters bilaterally. The bladder was only partially visualized.

To check on the status of the bladder, a cystoscopic examination was performed under spinal anesthesia on 9-1-49. At this time the bladder mucosa was found intact. Marked injection of the vessels was seen throughout the bladder and about the sphincter. Several areas covered with exudate were seen bilaterally on the postero-lateral portions of the bladder. These areas bled easily and biopsies were removed from them. The microscopic report of these biopsies was "small fragment of chronically inflamed bladder mucosa and a fragment of Gelfoam with beginning organization."

Two examinations of a twenty four hour urine specimen were negative for tubercle bacilli.

On 9-5-49 the supra pubic tube was removed and urethral catheter drainage maintained for several days. Following removal of the catheter the patient voided a good stream with a frequency of every hour and a half and with a capacity of four ounces. The suprapubic wound remained healed.

The patient was seen in the follow-up clinic on 11-19-49 and again on 2-18-50. He stated he was voiding hourly during the day, and three times at night, with a maximum capacity of nine ounces. There had been no recurrence of the hematuria.

COMMENT

Although the bladder was definitely the locus of the hemorrhage, and in such a location the cause for bleeding usually can be determined in the majority of instances, in this case one can only hypothesize as to its etiology.

Cystoscopic inspection of cases of interstitial cystitis often reveals "cracking" of the mucosa under the influence of bladder distention. Such a degree of mucosal denudation as was encountered in this case is beyond the experience of most observers of interstitial cystitis, but the possibility cannot be denied that this patient suffered from a very severe form of the disease.

Nor can it be denied that an allergic manifestation might have been responsible for the extensive loss of bladder mucosa. This might be tenable since there was no gross evidence of an intense infectious process which might have produced a mucosal gangrene.

The second point of interest stems from the method employed in controlling the hemorrhage. Customarily fulguration of localized areas of bleeding within

the bladder suffices for hemostasis. However, electro-coagulation was not satisfactory due to the very large area of bladder submucosa and muscularis exposed, as well as to the fact that the bleeding was mainly venous in origin. Venous bleeding is difficult to control by fulguration. Although unorthodox, effective hemostasis was secured by lining the weeping bladder with Gelfoam compressed by gauze packings. Urinary drainage was assured by maintaining indwelling ureteral catheters in each renal pelvis.

The patient's course was observed carefully in order to determine the effect of loss of considerable bladder mucosa with probable submucosal damage upon the ultimate capacity of his bladder. It is of interest to note the apparent complete regeneration of bladder mucosa as determined by cystoscopy performed several weeks following operation.

Although the period of observation has been short, the patient has lost only about 50 per cent of his bladder capacity, since he can void nine ounces at a time. His upper urinary tract has not suffered in that only slight ureteral dilatation existed at the time of his hospital discharge, on September 9, 1949, approximately one month post-operatively. Further intravenous pyelograms will be necessary for additional information on this important point.

SUMMARY

A case of massive idiopathic vesical hemorrhage associated with considerable loss of bladder mucosa has been presented. Its possible cause has been discussed, and a technique for controlling the hemorrhage has been offered.

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GOALS, PROCEDURES AND ACHIEVEMENTS IN CLINIC PSYCHOTHERAPY*

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Despite the increasing acceptance of psychotherapy by the general public, there is still current among physicians a surprising unawareness of the aims and achievements of psychotherapy, especially in psychiatric clinics. This unawareness sometimes gives rise on the one hand, to failure to use existing psychotherapeutic facilities, and on the other to exaggerated demands on psychotherapy. It must be stressed that there is nothing in psychotherapy quite comparable to the miraculous results induced by antibiotics. This paper is intended to dispel misunderstanding by describing what is done in the adult psychiatric out-patient clinics, and by presenting for consideration not only the aims and methods but the achievements and limitations of clinic psychotherapy.

The administrative organization of the adult psychiatric clinics can be briefly described as follows: There are three clinics each manned by 7 or 8 psychiatrists and headed by a chief of clinic who screens and assigns patients and supervises therapy through regular conferences. The psychiatrists devote six hours a week to the clinic but because of the weekly one hour conferences and the half hour conference with the chief of clinic as well as the time consumed in dictation, the psychiatrist can utilize only seven or eight half-hour sessions per week for interviews. Each psychiatrist carries an active load of about 15 patients. Many patients are seen once a week, some less frequently and few are seen more than once a week; there are, on an average, $2\frac{1}{2}$ visits per month per patient. The administrative staff consists of a part-time clerk and a full-time stenographer. There is a case work staff of 3 psychiatric social workers and a supervisor. The services of a clinical psychologist and 3 full-time volunteer assistant clinical psychologists are also available.

The clinic receives for treatment patients referred by other clinics and wards of the hospital who may or may not have been seen by the liaison psychiatrists attached to the medical and surgical out-patient departments and hospital wards. It is difficult to give an exact statistical analysis of the diagnostic categories treated. In one of the clinics the approximate breakdown of 90 patients is as follows:

- I Psychoneuroses (44)
 - a) Hypochondriasis—4
 - b) Anxiety Hysteria—9
 - c) Conversion Hysteria—6
 - d) Anxiety Neurosis—22
 - e) Obsessive-Compulsive Neurosis—3

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- II Schizophrenias (14)
- III Depressions (5)
- IV Psychosomatic Disorders (22)
- V Character Disorders (3)
- VI Unclassified (2)

The method of treatment is "psychotherapy" although a sedative or tonic is occasionally prescribed. The use of placebos is discouraged. Our aim in treatment does not differ from that which prevails in other branches of medicine, *i.e.*, restoration of function. In but few instances can complete anatomical and physiologic restoration be attained. In our clinics this can be done chiefly in acute cases, such as post-traumatic neuroses and acute conversion hysterias. Such material appears but rarely since our primary source of patients is from other clinics. We deal, therefore, largely with *chronic* psychiatric cases comparable to chronic medical and surgical problems. Thus we can hope to ameliorate, and restore our patients to practical functioning, but rarely can we restore them to complete mental health. Our role, nevertheless, may be quite as important as that of the internist or surgeon since, if our patients are not treated, complete incapacity may result. This fact must be borne in mind in order to avoid misleading the patient in vain attempts to achieve impossible goals. The therapist must recognize reality factors in his therapeutic aims and know where and when to stop.

By psychotherapy is meant an organized, conscious attempt to influence by psychological methods the state of mind of a person with symptoms. Psychotherapy is often incidental to drug therapy, physical therapy and other measures (1, 2). We believe that the mechanism of psychotherapy in these procedures is similar to that operating in "pure" or direct psychotherapy and our discussion will accordingly be confined to the latter (3).

Levine (4) in his "Psychotherapy in General Practice" cites 25 methods of psychotherapy for the general practitioner (including manipulation of the environment), as well as 5 *more advanced* methods, and 10 methods for the specialist. While there are minor differences in detail distinguishing one method from another, it is not necessary to make the differentiation quite so fine. In actual practice, the various methods merge into each other and it is much more important to understand the broad underlying basis of the psychotherapeutic approach.

We believe that the fundamental factor in psychotherapy is, what Freud has called, "transference." In the "Fragment of an analysis of a case of Hysteria" published in 1905, Freud (5) defined transference as "that phenomenon whereby the patient experiences *towards the physician* emotions and fantasies which are new editions or facsimiles of emotions and fantasies previously experienced towards a person intimately connected with the patient's past life". Freud originally said that "these tendencies have to be awakened and brought into life during the progress of the analysis". Later he observed that transference "is a psychical mechanism that is characteristic of the neurosis altogether, one that is evidenced in all situations of life (*i.e.* of the neurotic), and which underlies

most of the pathological manifestations." Ferenczi (6) stated that "the propensity for transference is the most fundamental peculiarity of the neuroses and serves best to explain" not only "acting out but conversion and substitution symptoms." Finally, it was recognized that transference is a characteristic of the normal individual as well as of the neurotic. The various schools of psychotherapy make diverse uses of transference and often refer to it as "the patient-physician relationship." For instance, in the Adlerian School, attempts are made to prevent dependent relationships by repeated interpretations, showing the patient the discrepancy between reality and his behavior towards the therapist and others in his environment. The so-called "brief psychotherapies" are based, to a great extent, on the varied uses of "transference" with all that it implies. Transference is a spontaneous phenomenon repetitively lived out as an emotional and behavioral experience with the complete repression (i.e. forgetting) of the original experience. Transference phenomena have the same meaning for patients as post-hypnotic suggestions. The patient rationalizes and may feel somewhat uncomfortable but does not fully understand his behavior. He expresses the repressed memory in action, not in thought.

A common example of transference in everyday life can be seen in the reaction of a speeding motorist when stopped by a policeman. Reality demands that the motorist either accept the ticket or "talk his way" out of the situation. Usually, however, there is a strong emotional reaction in which the motorist "transfers" to the policeman the hostility he felt in childhood towards his parents at the threat of punishment. As we can see from this example, the transference phenomenon is one which occurs in addition to the reality reaction. In every situation between patient and physician, whether the physician is a psychiatrist or not, there are two relationships (7). First, there is the reality relationship; this is based on actuality, the sick patient comes to a person skilled in healing sickness. Over and above the actuality there is the transference: the patient regards the physician as something more than he is (and frequently demands more than he is delivered) or else he exaggerates the value of what has been done. In all therapy and especially in psychotherapy, both of these relationships are important. In surgery it is conceivable that the transference relationship may be of little importance, but despite the cold, "scientific" aloofness of the operator, the attitude, *i.e.* transference, of the patient to the surgeon's entourage, hospital, etc., if not to the operator himself, belie this.

Like everything relating to human relationships there are seldom, if ever, "pure cultures" of transference phenomena and we usually deal with mixtures of positive and negative transferences with one or the other predominating. The realization of this is important because of its meaning in psychotherapy: for even when a patient displays an undesirable type of transference (as compared to the reality situation) proper management *e.g.* by cautious interpretation, may accomplish the therapeutic aim.

Proper management may take the form of pointing out the logical reality of the situation or it may permit the patient to express his hostility towards the therapist. The determination of what to do partly belongs to the "art" of psycho-

therapy. From the scientific view point, the physician's course may be determined not only by his *understanding* of the patient's transference but by his own ability to tolerate the positive and negative transferences of his patients without reacting with positive and negative transferences of his own (counter-transference). It is largely for the purpose of successfully handling his own counter-transferences that it is recommended that psychotherapists be psychoanalyzed. This has not been generally accepted by other than psychoanalytic schools of psychotherapy.

Schilder (8) has stated that every psychotherapeutic approach has three stages: 1. The winning of the transference (*i.e.* establishing a positive rapport). 2. The using of the transference and working *via* the transference. The transference can be used to educate the patient or to make him accessible to direct therapeutic suggestion, or it can be employed to give him a better insight by a fuller understanding of his symptoms; in this way he may be enabled to give them up. This is the psychoanalytic method. It should be realized that many patients recover without insight and that it is not always necessary for the patient to know what his symptoms mean in order to relinquish them. In clinic psychotherapy we do not aim to provide all the deeper insights to a patient but only those which he can tolerate and understand sufficiently to enable him to recover. In our clinics we do not psychoanalyze in the orthodox sense. Clinic psychotherapy does not aim to reorient the personality (ego) but to adjust the patient to life's necessities. Therefore, the therapist does not require as much detailed material nor does he necessarily trace the current problem back to its infantile origins. He deals with reality—conscious and pre-conscious material—and usually does not attempt to interpret in the strict psychoanalytic sense or at the levels of childhood sexuality (9, 10). The third stage is the breaking of the transference. This should enable the patient independently to approach the problems of actual life. The various schools of psychotherapy may modify these stages but the outline is fundamentally sound.

Before proceeding to a more detailed discussion of what we try to accomplish in our clinics, a word about the meaning of mental conflicts is desirable. Regardless of the diagnosis (*i.e.* the means of expression in symptoms) a neurotic conflict results when a person wants to do something which his conscience, *i.e.* his ego and super-ego, tells him he must not do. Quoting Freud; "Many of the methods of primitive and ancient medical science effected a cure by inducing in sick persons a condition of expectant faith" (11). These are frequently the conditions for psychotherapy which prevail today. What we try to do in our clinics is to relieve the patient of his conflicts so that there will no longer be a necessity to give expression to the conflict in symptoms. By telling his story to the physician, the patient transfers the function of conscience to the physician who, by his *non-critical attitude and listening* decreases the patient's sense of guilt. This verbalization by the patient with release of emotional tension is called abreaction, aeration or ventilation, and is probably the most important aspect of clinic psychotherapy. The patient regards the physician as an authoritative figure out of the past and acts out a repetitive drama with him with a more

satisfactory ending than in the original one. (If the original ending had been satisfactory, there would have been no necessity for the current episode or transference.) The frequent "living out" of such dramas often enables the patient to master the old traumatic situation and adjust to present reality. Technically, the psychoanalytic reader may call this "working through" rather than "abreaction" but the difference is chiefly quantitative (12).

Education also plays an important role in psychotherapy. Since misinformation can serve as a source of anxiety, the correction of the false belief may eliminate the anxiety. For example, an adolescent, worried over masturbation, may be cured if he accepts the assurance that masturbation does *not* lead to insanity. (Compare this concept of education, the correction of false facts, with the whole concept of psychotherapy which aims at correcting "false" emotions.) Education adds to the reassurance engendered by the non-critical listening of the physician.

It is sometimes necessary to advise the patient to leave a job in which he is unhappy, but retains because of his conscience. The advice may give him moral support (reassurance) and lessen his conflict.

Persuasion and suggestion are stronger forms of advice which are aimed more directly at the symptoms; hypnosis is the strongest form of suggestion. In these forms of psychotherapy we can clearly see that unless the patient "likes" the physician and wants to cooperate with him, there can be no cure. There is rarely any indication for hypnosis in our clinics, but there is no objection to its use when indicated nor to any other type of therapy indicated by special problems.

Technical considerations make the formal psychoanalytic procedure unfeasible. We occasionally interpret the transference and try to give the patient objective insight at superficial levels; more often we recognize the transference and work with it. We may even try to make it more positive by using reality factors. If we can give the patient a measure of insight, it is so much the better. If the patient must carry positive images of the therapist away with him as a support when he leaves treatment *without insight*, (identification with the therapist) we do not object. We even encourage it since our prime object is removal of symptoms more or less permanently, that is, restoration of function.

Social Service is a very important adjunct to the achievement of this aim, especially in selected cases. Those areas in which the worker can be used are briefly described as follows: (1) Environmental manipulation which will enable the patient to adjust more easily. (2) The gathering of information from the environment which will help the psychiatrist to diagnose, evaluate and form a plan of therapy. (3) Contacts with family members to provide understanding of the patient's condition, to interpret the need for therapy so that they will be able to accept the patient with his limitations, and to clarify their own role in the possible production and prolongation of the patient's illness. This is actually a form of psychotherapy especially useful where the subject may himself need therapy but refuses to see himself as a patient. (4) Direct work with the patient under the supervision of the psychiatrist *i.e.*, supplementary therapy for the patient who, because of employment, may not be able to continue at the clinic.

The factors which interfere with the achievement of our goals in clinic psycho-

therapy may be roughly grouped under four headings as follows: (1) Type of patients. Some patients because of the nature of the reality situation, the type of illness, background or lack of other endowments are not amenable to psychotherapy. (2) Limitations of space and time. Although it has been pointed out that increasing the time allotted to each patient, and the number of physicians working in the clinics, would still not solve the overall problem of supply and demand, yet these factors limit us insofar as they concern the handling of the current case load. (3) The therapist. What is accomplished in the clinic is, at least partly, a function of the therapist. Overzealous therapists, starting their psychoanalytic training and imbued with psychoanalytic principles often overstep the bounds of psychotherapy and indulge in deep interpretations, unnecessary dream analysis or, on the other hand, too rapid attempts at enlightenment of the patient. (4) Administrative. The out-patient departments of the medical and surgical divisions are not ordinarily considered as important, (as they are not, from the point of view of life and death) as the in-patient wards. This situation does not prevail in psychiatry. The medical, surgical or psychosomatic in-patient who requires psychotherapy is more often than not a *psychiatric out-patient*. Thus most of the therapeutic potential of the psychiatry department lies in its out-patient department as opposed to the therapeutic potential of the medical or surgical divisions which lies in its in-patient staff. Accordingly the question is raised for discussion whether it would not be wiser to augment the staff of the out-patient department both in quantity and in quality.

SUMMARY

From the foregoing it can be stated that psychotherapy, oriented as it is, as a speciality of medical practice, has as its aim as has medicine in general: preservation of life, relief from pain, and restoration of function. The procedure largely employed by clinic psychotherapists is based on the psychoanalytic framework of reference which regards neurosis as an inner conflict and which attempts to mitigate the conflict by appropriate manipulation of the transference, including its use to make the patient more aware of the realities of life. This aspect of the treatment of patients does not exclude but rather augments other therapeutic procedures of a medical, surgical or psychosomatic nature. Treatment of the "whole patient" furthermore utilizes as an important adjunct, the social service department with its influence on the patient's environment. The achievements of clinic psychotherapy may properly be compared to the achievements of the medical and surgical out-patient departments in dealing with subacute and chronic illness. Although the "miracles" frequently demanded of psychiatrists can rarely be performed, much personal satisfaction ensues from the frequent restoration of function. A clear understanding of the reality factors involved in the successes and limitations of clinic psychotherapy must inevitably lead to a more efficient utilization of psychiatric facilities.

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SMALLPOX AND VARIOLATION: THEIR HISTORICAL SIGNIFICANCE IN THE AMERICAN COLONIES*

SOLOM S. BERNSTEIN, M. D.

"That disease over which science has since achieved a succession of glorious and beneficent victories was then the most terrible of all the ministers of death. The havoc of the Plague had been far more rapid; but the Plague had visited our shores only once or twice within living memory, and the smallpox was always present, filling the churchyards with corpses, tormenting with constant fears all whom it had not yet stricken, leaving on those whose lives it spared the hideous traces of its power, turning the babe into a changeling at which the mother shuddered, and making the eyes and cheeks of the betrothed maiden objects of horror to the lover."
Macaulay, *History of England*.

Jenner's epochal discovery of vaccination in 1798 and its successful application throughout the civilized world, soon forced variolation, or the inoculation of variolous (smallpox) material, into scientific oblivion. Jenner was apparently unaware of the fundamental identity of vaccinia and variola and believed that cowpox was a distinct disease entity whose vaccine conferred immunity to smallpox for some mysterious reason. For almost a century antedating this discovery, the minds of the proponents and critics of variolation, the earliest and now almost forgotten immunologic method, were kept at a controversial level of fever heat.

The concept of protective inoculation dates from earliest times and variolation was practised at widely diverse areas in the Orient as early as the 6th century A. D. Among the Chinese variolous crusts were often introduced (by special "blowers") into the nose of the candidate for immunity (fig. 1) and it has been established that the Hindus were acquainted with the principles of active immunization. The large reservoir of folklore, rather than the conventional medical literary channels, provides the source of the modern knowledge of variolation. The practice was first introduced into western Europe by way of Constantinople where it had long been a popular procedure. Emanuel Timoni and John Pylarini, two Greek physicians practicing in Constantinople, after an exhaustive study of the method, issued their first report in the *Philosophical Transactions of the Royal Society* in 1716. (1) Pylarini described his technique for inoculation as follows: "By a sharp instrument of metal or gold held horizontally in relation to the place chosen for the operation, a few small incisions are made, either on the forehead at the base of the hair or on one of the cheeks or on the chin, preferably, however, on an arm or leg. The pus is then applied drop by drop to the incision with the same instrument. The wounds are then carefully covered by a dressing. The subject must be forbidden to touch the transplanted part and above all to avoid contact with damp". Pylarini kept his patients in bed for several days, had them follow a dietary regime which included meat and bread, observing them for forty days in all. Pustules appeared on or about the seventh day and were far less numerous and considerably smaller than in the naturally acquired disease.

* Read before the Seminar on Medical History, The Mount Sinai Hospital, New York City, April 17, 1951.



(Courtesy of Lederle Bulletin.)

FIG. 1. Ancient Chinese method of blowing variolous crusts into the nose of a candidate for smallpox immunity.

LADY MONTAGU

Despite the communications by Timoni and Pylarini, it was not until the influence of Lady Mary Wortley Montagu, the wife of the British Ambassador to Turkey, who observed and described the success of variolation in Constantinople, that its practice became generally known. (2) On her return to England in 1718, she devoted herself to popularizing the new method and had her three

children inoculated. Her influence at Court was so great that she succeeded in prevailing upon George I to have his two grandchildren inoculated, but only after successful preliminary experiments with six condemned criminals and seven orphaned children (3). Despite sporadic opposition from various quarters, largely stimulated by careless techniques or inadequate isolation, variolation was soon generally accepted throughout England.

Evidence that this practice continues to the present day among certain African tribes has been found by Klebs (4) and European naval physicians have recently observed instances of variolation in Algeria.

THE BOSTON EPIDEMIC OF 1721

The sturdy and God-fearing colonists of New England, exposed to the countless hardships of a rugged and precarious existence, met the ravages of a succession of smallpox epidemics with characteristic resignation. In the city of Boston, five visitations of the disease had taken over a thousand lives and disfigured many more. Epidemiologic control measures were of the crudest; those stricken with the disease were removed to the Pest House at the town's periphery where provisions for their care can only be imagined. Measures for quarantining suspected cases entering the harbor from endemic areas in the West Indies were completely inadequate and contacts were permitted uncontrolled access to the city's inhabitants. The deliberations of the Common Council are replete with resolutions and recommendations for controlling the spread of the infection but measures for their enforcement were hopelessly inadequate (5).

Boston was visited for the sixth time in April 1721 with what proved to be the most devastating epidemic to date. The community then boasted a population of 11,000; at the end of the epidemic, Aeneas Salter made a survey of its ravages and found that 5,989 had been afflicted and 894 of this number died; the disease was fatal for nearly one in seven.

The 1721 epidemic was presumably introduced into Boston from the *Tortugas* from H.M.S. *Seahorse* which entered the harbor on April 13th with several of the crew stricken with the disease. The distemper soon spread rapidly through the city, increased in severity and raged without abatement until the following January. In addition to the victims in the city itself, surrounding communities were sorely stricken; few families escaped the infection.

COTTON MATHER

Within a few days after the epidemic appeared, Cotton Mather (fig. 2), the famed fundamentalist divine, circularized the physicians of Boston, ten in number, urging them to inoculate the inhabitants with the contents of smallpox pustules as a means of protecting them against the disease. This practice was apparently totally unknown to the medical practitioners of the colonies and was first brought to Mather's attention by a curious series of circumstances. In 1707 his parishioners had presented him with a slave named Onesimos who later informed Mather that during his childhood in Africa he had been inoculated against smallpox and that such practice was the rule among the Gurumantese

tribes. His interest aroused, Mather questioned a number of other slaves who confirmed the widespread practice of inoculation in Africa. It is not improbable that Mather also read the observations of Timonius and Pylarinus which had appeared in the Philosophical Transactions (1). He obviously recognized the



Cotton Mather.

(Courtesy of the Bridgeport, Connecticut, Public Library.)

FIG. 2. Theologian who introduced variolation into the American colonies

significance of these reports and their application to the epidemic then raging, as shown by the following notation, of significant historical importance, which was entered in his diary:

"May 26, 1721. The grievous Calamity of the Small-Pox has now Entered the Town. The practice of conveying the Small-Pox by Inoculation has never been used

in America, nor in our Nation. But how many Lives might be saved by it, if it were practised. I will procure a Consult of our Physicians, and lay the matter before them" (6).

This was soon followed by Mather's "address to the Physicians of Boston" which precipitated a furious storm of abuse from most of the practitioners in the city and a "Battle of the Tracts" ensued.

ZABDIEL BOYLSTON, THE "INOCULATOR"

At least one Boston physician, under the prodding of Mather, courageously faced the torrent of medical abuse and invective. Within two days after receiving a note from Mather "*if upon mature deliberation you should think it advisable to be proceeded in, it may save many lives that we set value on*", Zabdiel Boylston inoculated his own son John and two negro slaves on June 26, 1721.¹

Despite the violence of the public outcry against the practice and the personal vilification to which its proponents were subjected, Boylston continued to inoculate and, moreover, invited the physicians of Boston to view his results; none accepted (7).

Hutchinson's observation that "*inoculation was introduced upon this occasion, contrary to the minds of the inhabitants in general, and not without hazard to the lives of those who promoted it, from the rage of the people*" (8) is borne out by the way Dr. Boylston and his family were treated. In fact, they were no longer safe on the streets; he was greeted with insults and it was general opinion that if any of his patients died, he was to be treated as a murderer. Cotton Mather's diary offers a colorful contemporary impression of the populace's temper:

"July 16: At this time I enjoy an unspeakable consolation. I have instructed one physician in the New Method used by the Africans and Asiaticks, to prevent and abate the dangers of the Small-Pox, and infallibly save the Lives of those that have it visited upon them. The Destroyer, being enraged at the proposal of any Thing, that may rescue the Lives of our poor People from him, has taken a strange possession of the People on this Occasion. They rave, rail, they blaspheme they talk not only

¹ Mather's letter to Zabdiel Boylston urging him to attempt inoculation

June 24, 1721.

Sir,

You are many ways endeared unto me, but by nothing more than the very much good which a graeious God employs you and honours you to do to a miserable world.

I design it, as a testimony of my respect and esteem, that I now lay before you, the most that I know (and all that was ever published in the world) concerning a matter, which I have been an occasion of its being pretty much talked about. If upon mature deliberation, you should think it advisable to be proceeded in, it may save many lives that we set a great value on. But, if it be not approved of, still you have the pleasure of knowing exactly what is done in other places.

The gentlemen, my two authors, are not yet informed, that among the (illegible) 'tis no rare thing for a whole company, or a dozen together to go to a person sick of the small pox, and prick his pustules, and inoculate the humour, even no more than the back of an hand, and go home and be a little ill, and have a fever and be safe all the rest of their days. Of this I have in my neighbourhood a competent number of living witnesses.

But see, think, judge: do as the Lord our healer shall direct you and pardon this freedom of, Sir,

Your hearty friend and Servant
Co. Mather

Dr. Boylston

like Idiots but also like Franticks. And not only the Physician who began the experiment but I also am the object of their Fury".

"July 18: The cursed Clamour of a People strangely and fiercely possessed by the Devil, will probably prevent my saving the lives of my Two Children from the Small-Pox in the way of Transplantation".

Boylston was twice called to account by the Selectmen, but, despite threats of dire consequences if he continued to inoculate, he persisted in the practice and when the epidemic ended, he had successfully protected 286 persons. In the face of the almost uniform hostility of the physicians, many of the influential ministers of Boston, led by Cotton Mather and his father, Increase Mather, vigorously defended Boylston and issued lengthy and eloquent tracts scourging his adversaries (9).

As the controversy raged with increasing bitterness, Boylston was again called to task by the Selectmen of Boston on July 21, 1721. *"In Relation to the operation called Inoculation lately practised in this Town by Dr. Boylston of this Place"*. Dr. Dalhonde, a Frenchman who had achieved a measure of local distinction, cited at this inquest a number of alleged instances of horrible deaths and crippling which resulted from inoculation as reported in foreign countries. On the basis of Dalhonde's patently spurious testimony, the physicians drew up a series of resolutions further condemning inoculation, to which the Selectmen subscribed. With the publication of Dr. Dalhonde's report, the citizens were gripped with terror lest the disease spread rapidly through the community because of inoculation, and their fury mounted. Although a few of the better educated favored the practice, the vast majority refused to follow their ministers' advice. Never had the influence of their spiritual leaders been so low.

Boylston issued a progress report on October 23, 1721 after inoculating 60 persons, in which the innocuousness of the practice was stressed; only one death followed the inoculation and this was ascribed to irrelevant causes. The opposition, however, did not abate and the Selectmen soon issued a ruling that all inoculated persons be removed to the Pest House. When Cotton Mather accepted a nephew into his home for inoculation, a lighted grenade was thrown through the window but happily failed to explode. Within the next few weeks, however, a gradual change in the public's temper made its appearance. This may have followed the publication of the Reverend Benjamin Colman's glowing and enthusiastic report after observing a number of inoculated individuals (10). Similar opinions were soon voiced by other influential citizens, including magistrates, and the custom became definitely established. At the epidemic's end, a total of 280 patients had been inoculated in Boston and environs of whom 6 died, or one in 46 as contrasted with a mortality of one in 6 or 7 in the naturally acquired disease.

In the light of modern psychiatric concepts, the motivations behind Cotton Mather's courageous advocacy of variolation opens an interesting field for speculation. This fiery theologian had throughout his career, been the leading apostle of rigid fundamentalism and the violent adversary of any symptom of modernism. He had consistently interpreted famines, conflagrations and epidemics as signs

of divine displeasure, to be borne with proper meekness, humility and contrition. It may be recalled that Cotton Mather was a firm believer in witchcraft and had written extensively on the subject. During the sinister witchcraft persecutions

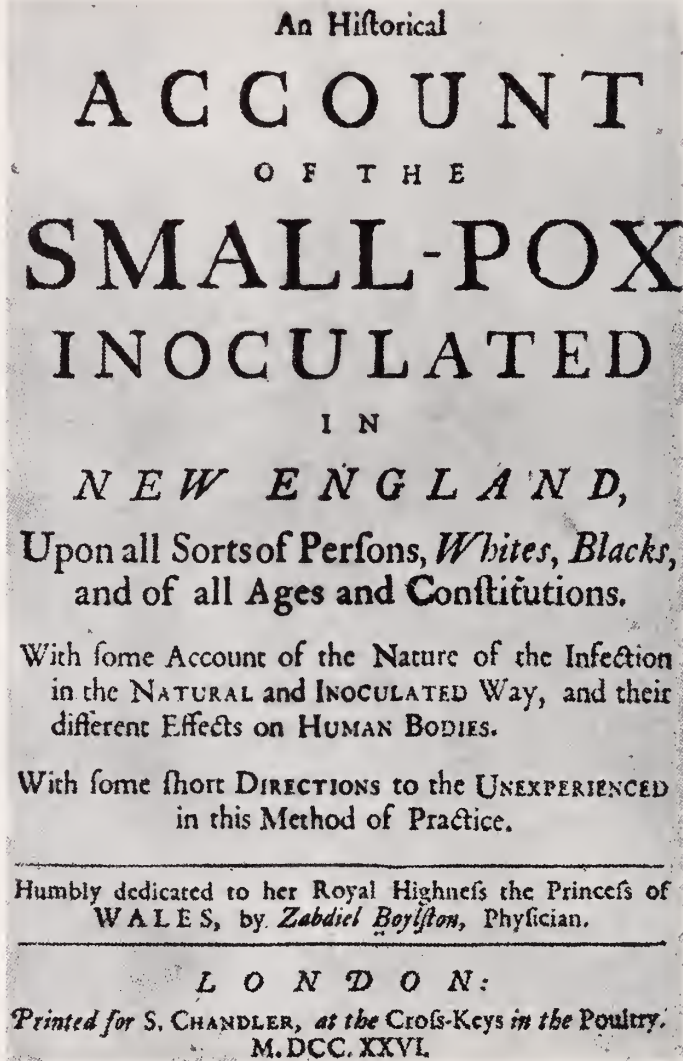


FIG. 3

at Salem in 1692, he investigated several cases of "diabolic possession" and was deemed personally responsible for inflaming the populace. His later writings and sermons, however, bear ample testimony to support the belief that he had largely recanted his bigotted stand and that he contemplated his earlier activities with a measure of shame. In view of his prodigious knowledge of current science

and a growing tolerance, one may essay the belief that his energetic and fearless defense of inoculation against smallpox may in part have represented a form of guilt expiation.

Despite the historical implications of Boylston's feat, which was the first recorded recognition of the role of immunology in the control of disease, his colleagues, including some who undertook to inoculate, were very grudging in granting him any credit; they continued, but with diminishing intensity, to attack him because of his unorthodox training (he was not a Harvard graduate) as well as for allegedly mercenary motives. The Selectmen sporadically continued their obstructionist tactics but organized resistance to the new practice was gradually dissipated.

At the invitation of Sir Hans Sloane, President of the Royal College of Physicians, who had encouraged Pylarini to publish his initial experience with inoculation, Boylston arrived in London in 1724. During a two year sojourn in England he lectured several times on variolation to the Royal faculty, was elected a Fellow in 1726 and in the same year published his treatise "*An Historical Account of the Small-pox Inoculated in New England*" (fig. 3). This volume is remarkable for the accuracy and completeness of its clinical observations, the first such work by an American physician (11). On his return to Boston, he resumed a comfortable practice, living quietly with his wife and eight children, inoculating on occasion when epidemics of smallpox threatened, but he was never again a controversial figure. The second edition of his *Historical Account* was published in Boston in 1730. In his sixties, he retired to his farm in Brookline, devoting himself to raising pedigreed horses. He died in 1766, at the age of 86, after many years of pulmonary trouble. Although Boylston was not trained at Harvard, his name is closely linked to the University's growth and prestige, and large academic foundations in his name were left by his greatnephew, Ward Nicholas Boylston, both to the University and the Medical School.

THE BOSTON EPIDEMIC OF 1753 AND EPIDEMICS ELSEWHERE

Boston was spared further epidemics of the disease until 1753 when 7,653 of its 50,000 inhabitants were stricken, of whom 2,109 were inoculated. Of those uninoculated, one in ten died whereas only one in 68 succumbed following inoculation. With improvement in techniques and adequate isolation of the subjects Sutton and his associates reported inoculating 20,000 in England with but three deaths.

Following the successful introduction of inoculation in Boston and neighboring communities, its use spread gradually throughout the colonies. When Philadelphia was visited by a severe epidemic in 1730, a few hardier souls permitted prophylactic inoculation. Benjamin Franklin lost his beloved four year old son from the disease in the epidemic of 1736 and soon altered his critical attitude to become an enthusiastic advocate of the measure. He wrote a foreword entitled: "*Some Account of the Success of Inoculation for the Small-pox in England and America*" to William Withering's manual on variolation published in England in 1754. The practice was given further impetus by Dr. Adam Thompson, a

leading Philadelphia inoculator, who in 1750 delivered a *Discourse on the Preparation of the Body for the Small-pox*, published in the same year by Franklin. This treatise was widely distributed and generally adopted in Connecticut, New

AN
ESSAY
 ON
INOCULATION,

Occasioned by the SMALL-POX being
 brought into *South Carolina* in the
 Year 1738.

—*Servare modum* -----
 —*Et non incauta futuri.* HOR.

WITH AN
APPENDIX,

Containing a faithful Account of its Event
 there ; where Eight only died out of above
 800 inoculated ; and a summary Relation
 of the principal Cases.

---- *Oculis subjecta fideliter* ----- HOR.

By J. KILPATRICK.

L O N D O N :

Printed for J. HUGGONSON in *Sword* and
Buckler-Court, Ludgate-Hill.
 MDCCLIII.

(Courtesy of the Library of Congress.)

FIG. 4. Title-page of Kilpatrick's Essay on Inoculation

Jersey, Maryland and South Carolina where the method proved highly successful. It consisted of a two week preparatory period in which the candidate's diet was limited to light, non-stimulating foods; he was then subjected to moderate

purging and bleeding as well as the administration of mercury and antimony. Following the inoculation, usually performed on the leg, a two week period of strict isolation was enforced.

In a severe epidemic in Charleston, South Carolina, in 1738, J. Kilpatrick, (fig. 4) a Scotch physician, successfully inoculated a very considerable number of persons and stimulated a revival of the practice. Kilpatrick's account, first published in Charleston and later in London in 1743, frankly recorded both his successes and failures (there were eight deaths in 800 inoculations). His method included careful preparation and isolation. In his essay, he describes the remarkable experiments and observations of his associate Mowbray, a surgeon, who very often inoculated with the virus taken from the pustules of a previous inoculation, repeated the process up to six times and observed no perceptible diminution in virulence. This was far in advance of the times and represented a valuable contribution to the knowledge of inoculation. Kilpatrick soon thereafter established himself in London as a specialist inoculator under the name of Kirkpatrick and wielded considerable influence over the by now highly receptive British public.

Although rigid adherence to this, and similar, methods reduced deaths from inoculation to a minimum, disquieting reports of fatalities from other areas created widespread apprehension and in many communities the practice, due to strong public revulsion, fell into disrepute. This situation largely resulted from the fact that a considerable number of untrained and unscrupulous persons, motivated solely by greed, had become self-styled 'inoculators'. They often failed to enforce adequate isolation or exercise even simple cleanliness. A number of epidemics and many instances of sepsis were traced to these charlatans. As the practice fell into disrepute, it was prohibited by law in some provinces and permitted under restrictions in others. Among the commonwealths expressly forbidding inoculation were Virginia, New Hampshire, New York and Connecticut. The bitterness of the opposition to variolation in New York was manifest in Governor Clinton's proclamation of June 6, 1747 (12): "*Strictly prohibiting and forbidding all and every of the Physicians, Surgeons, and Practitioners of Physick, and all and every person within this Province, to inoculate for the small-pox any person or persons within the City and County of New York, on pain of being prosecuted to the utmost vigor of the law*".

The degree of public and official antagonism to variolation is reflected in a contemporary *Writ of Arrest* for the illegal practice of inoculation in New Haven County, Connecticut, which is reproduced herewith (fig. 5).

VARIOLATION IN THE WAR OF INDEPENDENCE

In the relatively crowded areas of England in the 18th century, most adults had acquired natural immunity to smallpox through exposure to its effects in early childhood, a period when its manifestations were traditionally mild. In the sparsely populated and rural American colonies, however, the situation was very different, and apart from those residing in the more populous coastal communities few adults were naturally protected. Furthermore, the medical depart-

Thomas no proper Officer can be conveniently had to execute this writ There
 are therefore for James Arnold of Durham in the County of New Haven
 an indifferent Person Greeting
 Whereas the Grandjurors in Durham shew for the time being have on oath
 made Complaint & Information to me the subscriber against Moses Gaylord
 of Durham aforesd for that he S. Moses Gaylord in S. Durham in or about
 the 12th Day of instant March did voluntarily give & communicate the in-
 formation of the small pox by way of inoculation unto James Nichols Esq of S.
 Durham contrary to the Laws force & Effect of the Statute in that case provided
 And as by Complaint Dated the 21st Day of March A.D. 1777 on file

There are therefore in the Name of the Gov^r & Company of the State of Connecti-
 cut to command you forthwith to apprehend the Body of the S. Moses Gay-
 lord and him habe before me the subscriber at the first House in S. Durham
 to be warned touching the Premises and be dealt with according to Law
 fail not and due Return make Dated in Durham the 27th Day of March
 A.D. 1777

James Madenworth J. P. N. H. & G. C.

ment of the British army had long since introduced protective inoculation for those conscripts who had previously escaped the disease and were exposed to possible infection.

With the outbreak of hostilities in 1775, the most dangerous foe the colonists had to fight was smallpox. Washington wrote to Patrick Henry, then Governor of Virginia, in 1777: "I know that small pox is more destructive to an army in the natural way than the sword, and I shudder whenever I reflect upon the difficulties of keeping it out, and that in the vicissitudes of war the scene may be transferred to some Southern state" (13). We thus see Washington challenging the penal law against the practice of inoculation in his native Virginia. Bitter experience with the uncontrolled disease in two campaigns had converted him to variolation.

Following the Battle of Bunker Hill in June 1775, General Howe's forces occupied Boston, and Washington's troops were deployed on the surrounding hills observing, rather than besieging, the city. Although Washington's forces and munitions were inadequate for a successful siege, Howe was unable to attack because smallpox was rampant among the citizenry and to some degree among his troops. As inoculation was then the practice among the British, it is probable that the soldiers were incapacitated by the inoculated disease. Washington reported to the Continental Congress on December 4, 1775 that "General Howe is going to send out a number of the inhabitants, in order, it is thought, to make room for his expected reinforcements. There is one part of the information that I can hardly credit; a sailor says that a number of them coming out have been inoculated with the design of spreading the smallpox throughout the country and the camp". And ten days later he writes: "The soldiers who have never had it are, we are told, under inoculation, and considered as a surety against any attempt of ours to attack".

Washington met these threats with characteristic vigor and foresight, and without awaiting the sanction of the Continental Congress, ordered that such

TRANSCRIPT OF WRIT OF ARREST (FIG. 5)

Whereas no proper Officer can be conveniently had to execute this writ These are therefore to James Arnold of Durham in the County of New Haven an indifferent Person

Greeting

Whereas the Grandjurors in Durham afores^d for the Time being have an Oath made Complaint & Information to me the Subscriber against Moses Gaylord of Durham afores^d for that the s^d Moses Gaylord in s^d Durham on or about the 12th Day of instant March did voluntarily give and communicate the Infection of the small Pox by way of Inoculation unto James Tibbals Jr. of s^d Durham contrary to the Form Force & Effect of the Statute in that Case provided as s^d Complaint Dated the 21st Day of March A D 1777 on File

These are therefore in the Name of the Gov^t & Company of the State of Connecticut to command you forthwith to apprehend the Body of the s^d Moses Gaylord and him have before me the Subscriber at the Pest House in s^d Durham to be examined touching the Premises and be dealt with according to Law fail not and due Returns make Dated in Durham the 27th Day of March A D 1777

James Wadsworth Jr Just Pac

On reverse:

Newhaven County ss Durham March the 28 A. D. 1777 I then by virtue of this Writ took the Body of the within Nam'd Moses Gaylord and read the same in his hearing Tues.

Attest James Arnold Jr. Indift^t Person

117
Sir

Head Quarters Valley Forge 20th March 1778.

The Director General and the other Gentlemen of the Faculty having determined that it will be more convenient to inoculate all the Soulds that have not had the small pox, at or near the Camp, I desire that you will suffer none of them to be detained at Alexandria or George Town for that purpose. If the small pox should be in either, the troops are not to halt at or enter there. The Officers commanding the different detachments are to be directed to march thence slowly that they may not be overheated by exercise and thereby put in a habit prejudicial to inoculations. They are to make diligent enquiry whether the small pox be at any Houses upon the Road, and if it is to avoid those carefully. When the Officers arrive within a day or two's march of the Camp, they are to send forward to inform the Surgeons that proper accommodations may be prepared for them, should there be any places intended for small pox Hospitals below Alexandria, a copy of these orders is to be sent to the Officer commanding who is to obey them punctually. This is intended to extend to the Troops of North Carolina as well as those of Virginia.

I am &c.

Wth most obedient

Geo Washington

Commanding Officer

Alexandria

(Original manuscript loaned by Allyn Ford, Minneapolis, Minnesota, Director, National Society of Autographic Collectors.)

FIG. 6. George Washington's Directive, dated Valley Forge, March 20, 1778, to the Commanding Officer at Alexandria, relative to preventive smallpox inoculation (variolation) of all recruits.

of the militia as had not had the disease be promptly inoculated. When the British finally evacuated Boston on March 17, 1776, he ordered 1000 of his men with acquired immunity to take possession of the city. Despite his heroic efforts to isolate those infected with the disease, as well as the contacts, the distemper found its way into the country and many towns near Boston. It is thus apparent that at an especially crucial period in the fortunes of the embattled Colonials, a nine month deadlock extending from June 1775 to March 1776, resulted from an epidemic of smallpox in Boston and Washington's fear that his army might become infected.

Within a few months, another outbreak of smallpox proved to be the deciding factor in the Colonial campaign for the capture of the City of Quebec. Historians are largely in agreement that had this campaign been successful, the greater part, if not all, of Canada would now be in American hands. The Colonials, with superior forces and equipment, were making rapid progress toward the subjugation of the Quebec garrison when half their number were suddenly stricken with smallpox which was associated with a very high mortality. This disastrous turn of events compelled them to raise the siege, admit defeat, and retreat with their sick to Crown Point on Lake Champlain. Charles Cushing, an officer with the expedition, wrote: "We have now been at Crown Point for eight days and since then have buried great numbers from the smallpox. Some regiments which did not inoculate have lost as much as a third of their number". Conditions at this encampment were appalling and a member of Congress described the disaster thus: "Our misfortunes in Canada are enough to melt a heart of stone. The smallpox is ten times more terrible than the British, Canadians and Indians together. This was the cause of our precipitate retreat from Quebec". Another contemporary letter states "Our Northern army has left Canada and retreated to Ticonderoga and Crown Point. The smallpox has made great havoc among them . . . in short, the Army has melted away in a little time as if the Destroying Angel had been sent on purpose to demolish them". In the following month the situation grew progressively worse; the commanding officer, General Thomas died of the disease and his successor wrote to Washing-

TRANSCRIPT OF WASHINGTON'S DIRECTIVE; (FIG. 6)

Head Quarters Valley Forge 20th March 1778

Sir

The Director General and the other Gentlemen of the Faculty having determined that it will be more convenient to inoculate all the Levies that have not had the small pox, at or near the Camp, I desire that you will suffer none of them to be detained at Alexandria or George Town for that purpose. If the small pox should be in either, the troops are not to halt or enter them. The Officers commanding the different detachments are to be directed to march them slowly that they may not be overheated by exercise and thereby put in a habit prejudicial to inoculation. They are to make diligent inquiry whether the small pox be at any Houses upon the Road, and if it is to avoid them carefully. When the Officers arrive within a day or two's march of the Camp, they are to send forward to inform the Surgeons, that proper accommodations may be prepared for them. Should there be any places intended for small pox Hospitals below Alexandria, a Copy of these orders is to be sent to the Officer commanding who is to obey them punctually. This is intended to extend to the Troops of North Carolina as well as those of Virginia.

I am Sir

Yr most ob^t Serv^t

G. Washington

ton: "The rate of the smallpox deprives us of a whole regiment in the course of a few days. Of the remaining regiments from 50 to 60 in each are taken down in a day, and we have nothing to give them but salt pork flour and the poisonous waters of the lake" (13).

In June 1776, of 10,000 men in the Northern Army, 5,500 were unfit for duty chiefly due to the ravages of smallpox. The British on the other hand, protected both by natural immunity and the established practice of protective inoculation were able to go through the entire period of the war with scarcely any cases of the disease.

Throughout this critical period, Washington sought by every means at his command to influence Congress to legalize the practice for the entire military personnel. The spread of the disease was not only rapidly sapping the country's military resources, but fear of infection had largely stopped the flow of recruits. Furthermore the results of the wholesale inoculation of the Northern army had been very successful and by August 1776, the scourge had been completely eradicated. By this time, however, British reinforcements had arrived in considerable number on the St. Lawrence and a Colonial attack on Canada would probably have been doomed to failure. With this evidence it can hardly be an exaggeration to say that smallpox was the main cause for the preservation of Canada for the British Empire.

An interesting sidelight on the controversial attitude toward inoculation is contained in a recently discovered letter of General Horatio Gates which was written in August 1776 while he was commanding troops concentrated at Ticonderoga (14). In constant dread lest fresh epidemics be precipitated by charlatan inoculators, the document leaves little doubt as to his attitude:

"A Villain of a surgeon, for what is commonly called doctor, is inoculating the militia as fast as they arrive. . . . Such a slave to private gain who would sacrifice the Army for the sake of obtaining a few dollars for himself, deserves to be immediately brought to condign punishment. Were he within my reach it would not be many minutes before he would feel the weight of my resentment. As that not being the case, I must apply to you to beg you to write to the chairman of the committee . . . directing him to exert his utmost power to stop this most pernicious practice, & if possible to send the doctor instantly to Jail. As fine an Army as ever marched into Canada has, this year, been entirely ruined by the smallpox. If the Militia, which ought, long ago, to have been here, are once infected, this country will infallibly be exposed to the invasion of the enemy. Such officers as have staid upon the way, to be inoculated, shall, they may depend upon it, be brought to a general court-martial."

When Washington finally received qualified permission from Congress in January 1777 to inoculate his levies, he instructed Dr. Shippen, the Medical Director, as follows: "Finding the Small-Pox to be spreading much and fearing that no precaution can prevent it from running through the whole of our Army, I have determined that the troops shall be inoculated. The expedient may be attended with some inconvenience and some disadvantages, and yet I trust in its consequences will have the most happy effects. Necessity not only authorizes but seems to require this measure, for should the disorder infect the Army in this natural way and rage with its usual virulence, we should have more to dread from it than from the sword of the enemy. I would fain hope that in a short space of time we shall have an Army not subject to this the greatest of all calamities that can befall it when taken in the natural way." (15).

The troops enthusiastically accepted the procedure and were inoculated in batches, the two churches in Morristown being used as the centers for isolation. Within a comparatively few weeks the disease was almost completely eradicated with Washington's principal danger entirely and permanently removed. Little more was heard of this dread complaint even when the army moved south. It is recorded that the deaths from the naturally acquired disease exceeded sixteen per cent whereas the mortality from the inoculated disease, when properly controlled, averaged but one in three hundred; many regiments of five hundred men were inoculated without a single loss.

The adoption of this measure removed the chief obstacle to recruiting. Within a few months Gates army, freed of smallpox, compelled Burgoyne's surrender at Saratoga. Washington's smallpox-free army, growing from strength to strength, ultimately succeeded in forcing the surrender of Cornwallis at Yorktown in 1781.

INOCULATION.

THE subscriber respectfully informs the public that he has lately opened an Inoculation, at the pleasantly situated hospital in Glensbury; Gentlemen and Ladies who wish to have the Small-Pox by this safe and easy method, may be boarded, and have faithful attendance paid them, by their obedient,

ASAPH COLEMAN.

March 23, 1797.

EIGHT months is allowed by the Court of Probate for the district of Hartford, for the creditors of the estate of Col SAMUEL TALCOTT, late of Hartford deceased;

An advertisement of an "inoculation farm."

FIG. 7

VARIOLATION IN THE POST-WAR PERIOD

Following the successful use of inoculation against smallpox in the war, the practice was generally re-established among civilians, but under much closer supervision than heretofore. Isolation became mandatory and fatalities were rare. Although many physicians undertook the practice, the bulk of the citizenry still turned to lay practitioners. Inoculation "farms" sprang up and were widely advertised (fig. 7). The term "to buy the smallpox" came into common usage as it had in Constantinople in the early days of variolation. The popularity of the practice soon reached such proportions that "inoculation parties" were formed so that the period of isolation could be pleasantly and convivially endured.

Smallpox inoculators, both medical and lay, and privately owned hospitals established solely for the procedure, advertised enthusiastically in the papers and were careful to specify whether they were prepared to treat "the rich or the

plebeian". A somewhat colorful announcement in a Boston paper under the date of January 16, 1798 follows:

"Ibrahim Mustapha, Inoculator to his Sublime Highness and the Janisseries: original Inventor and Sole Proprietor of the Inestimable Instrument, the Circassion Needle, is just arriv'd from Constantinople where he has inoculated about 50,000 people without losing a Patient. He requires not the least Preparation Regimen or Confinement, Ladies and Gentlemen who wish to be inoculated need only acquaint him with how many Pimples they choose and he makes the exact number of Punctures with his Needle which produces the Eruptions with the very Piequers. Ladies who faney a favourite Pitt may have it put in any spot they please, of any size " (16).

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JACOB L. MAYBAUM, M.D.
1884-1951

JACOB L. MAYBAUM, M.D.

1884-1951

While seemingly recovering satisfactorily from a chronic debilitating illness, Dr. Jacob L. Maybaum died suddenly at The Mount Sinai Hospital on May 31, 1951.

He was born and reared on the Lower East Side of New York City. On completing his high school education he entered Cornell University, on a four year scholarship, and in 1905 received his M.D. degree from that institution. His first five years as a physician he devoted to general practice, and was employed part of the time by the Department of Health of the city of New York.

He began his training in otolaryngology in 1910 as an Assistant in the Out-patient Department of The Mount Sinai Hospital. This was followed in 1916 by post-graduate studies in otolaryngology at the Universities of Berlin and Vienna. One year later, upon his return from abroad, he joined the staffs of the Manhattan Eye and Ear and the Post Graduate Hospitals as assistant aural surgeon and instructor. There he soon gained recognition as a most competent teacher in surgical anatomy.

Dr. Maybaum's association with The Mount Sinai Hospital began in 1910, but recognition was extended to him in 1921 when he was advanced to the rank of associate otologist. In this capacity, for the following sixteen years, he dedicated much of his energy and time to his duties as he did during the subsequent ten years as otologist to the Hospital.

As chief of the Otologic Service, Dr. Maybaum displayed a keen foresight and made every effort to improve the quality of his Service. When the fenestration operation was still in its early phase and in the process of being perfected, he was one of the first to envisage the great possibilities that this operation offered for the relief of the hard of hearing. He not only grasped the opportunity to master the surgical technique himself, but encouraged the members of his staff to do likewise. It is largely due to his efforts that the fenestration operation was first initiated at The Mount Sinai Hospital, where within a short time it became a standard procedure.

In 1946 he was appointed consultant otologist to the Hospital. His interest in and loyalty to the Hospital remained unaltered until his death.

Dr. Maybaum's diagnostic and surgical skill have placed him high in the ranks of his profession. While clinical otology engaged his chief interest, he appreciated the value of other phases of this specialty such as audiology, otopathology, and neuro-otology. He was frequently consulted on difficult neuro-otological problems. He enriched the literature by many contributions on this and related topics.

He was a member of many medical organizations and a past chairman of the otolaryngological section of the New York Academy of Medicine.

Dr. Maybaum was a man of innate modesty and humility. He inspired the

love and gratitude of thousands of patients and won the admiration of his associates and friends. His honesty of purpose never could be questioned, and his staff had ample reason to know that no one could be more thoughtful and more considerate of their welfare.

Many will treasure the memory of Dr. Maybaum. His patients, his students, and his associates have lost a dear friend.

JOSEPH G. DRUSS, M.D.

ABSTRACTS

AUTHORS' ABSTRACTS OF PAPERS PUBLISHED ELSEWHERE BY MEMBERS OF THE MOUNT SINAI HOSPITAL STAFF

Members of the hospital staff and the out patient department of the Mount Sinai Hospital are invited to submit for publication in this column brief abstracts of their articles appearing in other journals

A Peculiar Intermediary State Between Waking and Sleeping. EMIL FROESCHELS. *Am. J. Psychotherapy*, 3: 19, January, 1949.

In a previous article the author described certain phenomena of speech and thought which occur on the verge of sleep when the waking mind is slowly flickering down. These transition phenomena differ from dreams in that a functioning consciousness is present, and they differ in their peculiar logical form and content from the thoughts of the person who is awake. Usually only the content of the dream is in the mind of the dreamer, but in transition phenomena we frequently find feelings of annoyance about the thoughts, feelings apparently resulting from criticism directed by the still surviving wakefulness, against the fantastic logic and content of the transition phenomena. While the latter (dreams) represent an order similar to that of our waking-thinking (although some dream events would seem impossible in waking life), to the observer, the transition state hardly ever offers anything but a chaos. The fundamental "categories" underlying these processes have not thus far been taken into consideration. The conclusion anticipated is that in the state of transition, mental (subconscious) identification takes place between representations of persons, animals, things or functions that have only a single characteristic in common. The transition state really identifies them. They flow together into a unity. It should be stressed that the waking mind, rightly or wrongly, identifies only if the most essential entity remains, despite some or many changing properties, e.g., in case of a human being that is identical with himself throughout his life. Yet, if similar things or functions are submitted to a thorough analysis by the mind, similarity breaks down into equality and inequality, and the feeling that persons, etc., are similar, vanishes. Hence it can be concluded that the feeling of similarity is not developed by the critical mind, since, the critical mind is chiefly characterized by its trend to distinguish between equal and unequal. The careless use in the transition state of some categories (e.g., differentiation—identification; essentiality—accidentalness, causality) and of the two forms of intuition (Kant), namely time and space, and the use of by far too few categories, is the reason for the feeling of annoyance in the still waking mind during the state of transition. Whether it is characteristic for the transition state to deal only with 2 persons, 2 animals, 2 things or functions, can not as yet be decided. Similarity evidently does not mean to the subconscious what it means to conscious reasoning. The latter takes the feeling of similarityt mos of the time as a stepping stone on the way to thorough differentiation and identification. The subconscious on the other hand frequently considers similarity identical with identity, and does not bother with further "research".

Third Ventriculostomy Proven Patent After Fifteen Years. IRA COHEN. *J. Neurosurg.*, 6: 89, January, 1949.

A case history is given of a woman who at the age of 17 had an exploratory craniotomy for a suspected chiasmal lesion which was causing visual and endocrine disturbances. A "cyst" was thought to have been encountered and emptied. She improved and continued well for 15 years when there was a return of her symptoms plus deafness. A calcified tumor of the vermis was encountered at the second craniotomy. She died after four days. The

postmortem studies showed that at the first operation a 3rd ventriculostomy had been done, that the dilated third ventricle which was mistaken for a cyst had caused pressure on the chiasm and pituitary gland. The opening remained patent as disclosed by the post-mortem studies.

New Possibilities in Private Psychiatric Practice. C. P. OBERNDORF. *Am. J. Psychiat.*, 105: 589, February, 1949.

In private psychiatric, and especially psychoanalytic, practice, the physician has a tendency to become self-satisfied and smug because he works in isolation and is not subject to the scrutiny of his colleagues which physicians in other fields are. Furthermore, there is a tendency for the psychoanalyst to restrict the range of his activity because he unconsciously is likely to select the particular type of case or personality with which he feels an empathy. There is great danger that his technique and philosophical approach become narrowed and stereotyped. The author recommends the establishment of psychiatric group practice to include men of diverse interests and skill, who may profit from their contacts. At the same time, such group practice would afford opportunity for the treatment of a greater number of patients at fees which might be met by the lower income groups. Also to counteract constriction, the association of a private practitioner in psychiatry with clinics connected with general hospitals is recommended, as well as the opening of doors of State Hospitals for the mentally ill to the physician in private practice for part-time work.

Arteriography in Cerebral Vascular Accidents. I. S. WECHSLER AND SIDNEY W. GROSS. *J. A. M. A.*, 139: 502, February, 1949.

The authors report on the results of arteriography in patients with cerebral hemorrhage and the indications for evacuation of blood or clot following intracranial hemorrhage. They feel that arteriography is a safe method in patients who are otherwise in good condition following the ictus. The arteriogram alone can differentiate with certainty between hemorrhage and thrombosis and points to accurate localization. The arteriogram, too, has the therapeutic merit of indicating whether surgical attempts should be made to evacuate the clot or whether dicumarol or heparin may be given to patients in whom the diagnosis of thrombosis is positive. Ten cases are reported, 6 with hemorrhage and 4 with thrombosis. Removal of a clot in one and evacuation of a hemorrhage in a second resulted in rapid recovery.

Angiocardiography in the Differential Diagnosis of Pulmonary Neoplasms. H. NEUHOF, M. L. SUSSMAN, AND R. A. NABATOFF. *Surgery*, 25: 178, February, 1949.

This study was carried out in order to ascertain the effects of various pulmonary neoplasms upon the pattern of the pulmonary artery and its branches. By means of contrast visualization of the pulmonary vascular pattern, certain criteria have been evolved which are of value in the differential diagnosis of pulmonary neoplasms. The main bronchus malignant lesions often involve major branches of the pulmonary artery, causing compression, irregular distortion and varying degrees of obstruction. In those cases in which the infiltrating lesion arises from a small bronchus, similar changes involving smaller branches of the pulmonary artery are seen. In well-circumscribed tumors, the adjacent vessels are spread apart and encircle the lesion mediastinal and pleural lesions cause no significant changes in the angiograms.

Observations on the Use of Sodium Amytal in the Treatment of Aphasia. B. W. BILLOW. *M. Rec.*, 1, February, 1949.

The use of sodium amytal in the treatment of aphasia in 2 patients is reported. The patients were given a 5 per cent solution intravenously at a slow rate. A hypertensive woman was seized with a right hemiplegic attack associated with mixed aphasia. Within approximately 2 weeks she regained slight use of her limbs, but was unable to utter a sound. The author decided to use sodium amytal intravenously. After about 3½ ccs. of the solution, the patient began to utter a few sounds, such as her husband's name and the day of the week. The patient was given 3 more injections, and there was a noticeable improvement

in her vocabulary, and her enunciation became more distinct. However, there was no improvement, and treatment was stopped. Another patient was seen who was completely paralyzed. She was mute, and made frantic efforts to speak when first examined. However, no intelligible sounds were forthcoming. Sodium amytal was given to her intravenously. The patient showed remarkable improvement. She began to speak in single words; they were pronounced distinctly, and her mind was clear. The author reexamined her several hours later; sodium amytal was repeated, and this time she spoke in sentence-like structure and executed instructions given her. She was given 4 more injections. Since no further improvement in speech was noticeable, sodium amytal therapy was stopped. Both patients appeared to be in better spirits after these injections and made determined efforts to speak. However, while the drug hastened improvement in speech, it was of temporary nature. The final efficacy of the use of sodium amytal in the treatment of aphasia is held in abeyance until more extensive case histories are observed and reported.

Immunity of Diphtheria Induced by a Booster Dose of Alcohol-Refined Alum-Precipitated Toxoids: Based on a Study of 59 Allergic Children. H. G. RAPAPORT AND M. M. PESHKIN. *Ann. Allergy*, 7: 165, March/April, 1949.

Fifty-nine allergic children who had been primarily immunized against diphtheria in early childhood were given a booster injection of a purified toxoid from which the allergenic fractions of the toxoids had been eliminated without disturbing its high antigenic potency. Thirty-four children were injected with the alcohol-refined, alum-precipitated combined diphtherial and tetanal toxoids and 25 children with the alcohol-refined, alum-precipitated diphtherial toxoid alone. The dose consisted of 0.5 cc. of either toxoid. From 1 week to 4 months later, diphtherial antitoxin titer had risen in all the children an average of 123 times above the corresponding antitoxin level obtained prior to the booster injection of toxoid. The maximum antitoxin titer occurred two months after the booster dose. No constitutional reactions and only minimal local reactions occurred. The alcohol-refined, alum-precipitated diphtherial toxoid, alone or combined with tetanol toxoid, can be currently regarded as the most ideal and reliable preparation for immunization against diphtheria.

Regulation of Food Intake in Normal and Esophagostomized Dogs. HENRY D. JANOWITZ AND M. I. GROSSMAN. *Fed. Proc.*, 8: 81, March, 1949.

Factors concerned in regulating intake of food were investigated in dogs by noting 1) effects of intragastric feeding on normal feeding in dogs with gastric fistulas, 2) effects of real and sham feeding on eating time in dogs with esophagostomies, and 3) effects of oral supplementary prefeeding on food intake in intact animals. These studies disclose two sets of factors which under standardized conditions influence regulation of intake of food 1) oral factors ("gustatory satiety"), and 2) gastric distention factors, which to be effective must act simultaneously with the oral factors.

Role of Blood Sugar Levels in Spontaneous and Insulin Induced Hunger in Man. HENRY D. JANOWITZ AND A. C. IVY. *A. Applied Physiol.*, 7: 643, March, 1949.

The fluctuations in blood sugar levels which occur spontaneously in fasting human subjects are small and cannot be correlated with the spontaneously occurring phases of hunger sensations. Hyperglycemia produced by intravenous injection of glucose has no detectable effect upon those spontaneously occurring hunger sensations. When abnormal hypoglycemia is induced by insulin injection, hunger sensations are evoked. These begin after the blood sugar has begun to rise from its nadir and subside before the normal blood sugar level is attained.

The Specific Antigens of Variants of Shigella Sonnei. E. E. BAKER, W. F. GOEBEL, AND E. PERLMAN. *J. Exper. Med.*, 89: 325, March, 1949.

The isolation and immunochemical properties of the antigens of a number of strains of *Shigella paradysenteriae* were described in previous reports. *Shigella sonnei* was selected

for further study to the chemistry of antigens because of the readiness with which it dissociates into intermediate and rough colony forms. A number of fairly stable variants were obtained; 1, an organism with smooth colony morphology called Phase I, 2, intermediary forms called Phase IIs and Phase IIr, the latter distinguishable by its somewhat rough colony morphology, and finally a Rough variant. The somatic antigens of the Phase I and Phase IIs organisms were isolated in electrophoretically homogeneous form. They are both antigenic, lipocarbohydrate protein complexes of similar chemical constitution but precipitin tests with these antigens shows the same pattern as found by cross-agglutination tests. Thus Phase I is distinct from Phase IIr, IIs, and Rough strains. Phase IIr and Phase IIs are identical serologically but are distinct from the Phase I and Rough variants. The last does not cross react with any of the other *Shigella sonnei* variants.

The Electrical Topography of the Surface of the Univentricular Heart. B. KISCH. *Exp. Med. & Surgery*, 7: 55, February, 1949.

The electrograms taken with direct leads from different points of the surface of the univentricular hearts of fish and frog respectively differ from each other constantly and conspicuously. This is mainly due to time differences in the spread of the excitation wave over the surface of the heart. Inside the ventricle in most instances, a deep QS is present. As a rule on the surface of the apex the ECG shows a QRS complex of the left ventricle type (high R small S or no S at all) on other places such as the left side of the base of the ventricle a cardiogram of the right ventricular type (small R deep S) can be registered simultaneously. The local electrogram at each place of the surface of the heart is influenced mainly by the intrinsic deflection of the particular place, the time of its onset, its voltage and its duration. At the beginning of the QRS complex the influence of the electrical behavior of the subendocardial part of the heart muscle is also noticeable. The direct electrogram of the heart's surface is also influenced by the electrical potentials of surrounding parts of the subepicardial muscle. The rapid deflections at the start of the ECG are due to initial explosive exothermic chemical processes and their immediate consequences at the start of muscle excitation. The slow part of the ECG, from the end of S up to the end of T, represents the electrical effects of the complicated chemical processes which follow and finally lead to a restoration of the original biochemical equilibrium in the heart muscle.

Essential Xanthomatosis. B. SCHICK AND W. M. SPERRY. *Am. J. Dis. Child.*, 77: 164, February, 1949.

A patient with essential Xanthomatosis of the Xanthoma tuberosum type was observed for 15 years, during 13 of which he lived on a diet containing negligible quantities of cholesterol. No regression of the disease was noted, pronounced hypercholesterolemia continued. Thyroid, insulin, lipocaine, vitamin B complex etc. had no effect. The mother and father of the patient were both hypercholesteremic and one brother maintained an abnormally high concentration of cholesterol in his serum. The observations in this family emphasize the hereditary nature of essential xanthomatosis and support the concept that an inherited hypercholesterolemia is the primary disturbance in this disease.

Benign Paroxysmal Peritonitis-Second Series. SHEPPARD SIEGAL. *Gastroenterology*, Vol. 12: 234, February, 1949.

This paper describes 6 new cases of benign paroxysmal peritonitis. This disease begins in early life continuing in attacks for many years. Abdominal pain with peritoneal irritation, fever and leucocytosis are characteristic. Chest pain is frequent. Free intervals vary from 1 to 4 weeks, but remissions of the disease may occur which may last for several years. These patients remain otherwise well. In the early stages of this disease, it may be impossible to differentiate the attack from acute appendicitis or other acute surgical abdominal conditions. Hyperemia or edema of the peritoneum sometimes with serous or sero-fibrinous exudate is the operative finding. In one instance, 5 male members of a single family were affected. All published cases thus far have been either Jewish or Armenian. The disorder appears to have a close relationship to allergy.

ABSTRACTS

Production of Constrictive Pericarditis in Dogs. A. P. FISHMAN, L. H. RUBENSTEIN, L. W. SENNETT, AND K. KURAMOTO. Fed. Proc., 7: 45, March, 1949.

Incident to the investigation of cardiodynamics in congestive heart failure in dogs, it became necessary to produce a consistently effective method for the production of pericarditis in dogs. The fluoroscopic identification of the pericardial sac by thorotrast, followed by the instillation of irritant solutions, was followed by a sero-fibrinous, cardiodynamically-insignificant, pericarditis. However, an envelope of polythene, surgically placed, resulted in massive pericardial effusion. Within two weeks the surface landmarks of the heart were completely obliterated. In 4 to 6 weeks, distended neck veins, hydrothorax, ascites, hepatomegaly ensued. The dogs died in 4 to 8 weeks if the polythene was not removed. If the heart was not completely surrounded by polythene, or if the polythene was subsequently removed, the dogs continued to live (up to one year) and constrictive pericarditis resulted.

Visceral Thrombophlebitis Migrans. I. GERBER AND M. MENDLOWITZ. Ann. Int. Med., 30: 3, March, 1949.

Although involvement of the visceral veins with recovery is not uncommon in thrombophlebitis migrans, the disease may be fatal. The clinical features and pathological changes in 11 autopsied cases are reviewed. Of these, 6 are reported by us and 5 collected from the literature. The protein clinical manifestations caused by involvement of various organs as the complex systemic features of the disease are described. Pathogenesis remains obscure and therapy is limited.

Hyperchloremic Acidosis and Nephrocalcinosis: The Syndrome of Pure Lower Nephron Insufficiency. E. M. GREENSPAN. Arch. Int. Med., 83: 271, March, 1949.

The syndrome of distal tubule nephrocalcinosis with chronic hyperchloremic acidosis is described for the first time in an adult. The renal lesion was associated with an unusual form of chronic discrete lower nephron insufficiency manifested by isosthenuria, diminished ammonia excretion and fixed urinary alkalosis in the presence of a blood acidosis, hyperchloremia and relatively good glomerular function. The patient was treated successfully for 3 years on an oral regimen of large doses of sodium citrate and citric acid. A brief discussion of the physiologic mechanism of lower nephron insufficiency is included, as well as a synopsis of the differential diagnosis in the presence of this lesion. The role of sulfathiazole as a possible etiologic factor in the production of nephrocalcinosis is discussed.

The Lability Test: A New Procedure for the Diagnosis of Chronic Simple Glaucoma. S. BLOOMFIELD. New York State J. Med., 49: 659, March, 1949.

A new test devised by Bloomfield and Lambert for the early detection of chronic simple glaucoma is described. It provides a quick and simple means for the recognition of this insidious disease. A study of its results when applied to a series of eyes with chronic simple glaucoma and to another group without this condition indicates that it is a highly reliable test for the disease. An experimental comparison of the lability test with other diagnostic procedures for chronic simple glaucoma has demonstrated that it offers several advantages over previous methods for early detection of the condition.

The Roentgen Diagnosis of Adenomyosis Uteri. M. A. GOLDBERGER, R. H. MARSHAK, AND M. HERMELL. Am. J. Obst. & Gynec., 57: 563, March, 1949.

Adenomyosis of the uterus is a condition characterized by benign invasion of the endometrium into the uterine musculature, associated with overgrowth of the latter. This invasion of endometrium into muscle forms tube-like structures into which the radiopaque media may penetrate producing according to our findings, a rather characteristic roentgen

film. Short spicule-like structures extend especially from the superior surface of the uterus varying in size from 1 to 4 mm. and ending in very tiny sacs. This roentgen findings was noted in approximately 15 per cent of the cases of adenomyosis. Some of the cases of adenomyosis found at operation which did not reveal the tiny sacs on review of the roentgenograms showed an irregularity of the uterine border. This irregularity was more marked and was usually noted with hyperplasia of the endometrium. We have recently visualized these tiny sacs more frequently. A possible explanation may be the use of the water soluble media in preference to the slowly absorbed media. On occasion adenomyosis can produce a filling defect within the uterus which simulates a submucous fibroid. The uterine wall in these cases is unusually thick and probably only permits the dye to outline the periphery of the uterine cavity.

Hyperparathyroidism—Stimulating Paget's Disease. S. P. ZIMMERMAN. *Ann. Int. Med.*, 30: 675, March, 1949.

The consensus among investigators interested in bone diseases is that generalized osteitis fibrosa cystica, and Paget's disease, represent 2 definite, independent, clinical entities. However, there are several cases which do not quite fit into either category but which appear to be examples of cases which exhibit coexistent features of hyperparathyroidism and Paget's disease. A case is presented where recalcification and healing manifests itself in a form which is roentgenologically indistinguishable from Paget's disease. It is felt that this is a case of von Recklinghausen's disease which on healing acquired the bone picture of Paget's disease.

Agenesis of Abdominal Muscles with Associated Malformation of the Genitourinary Tract. W. OBRINSKY. *Am. J. Dis. Child.*, 77: 362, March, 1949.

Forty-one cases of congenital absence or agenesis of the abdominal muscles have been reported. The muscular defect occurs almost exclusively in males and is associated with genitourinary pathology which may include an enlarged bladder, hydroureter, and hydronephrosis. Cryptorchism is almost always present. The cause of this strange combination of anomalies is unknown. No significant urinary obstruction has been demonstrated in these patients. It would appear probable that the muscular agenesis is primary and, by causing incomplete emptying of the bladder, leads to an adynamic type of hydronephrosis. Most of these patients die in early childhood of progressive renal failure or secondary infection. This report is of a 5½ month old infant with the above syndrome who died of uremia.

Results of Prolonged Medical Treatment of Obesity with Diet Alone, Diet and Thyroid Preparations, and Diet and Amphetamine. D. ADLERSBERG AND M. E. MAYER. *J. Clin. Endocrin.*, 9: 275, March, 1949.

A group of 299 obese patients treated under controlled conditions in the Nutrition Clinic of a large general hospital showed wide fluctuations in the therapeutic results. In group A in which only low caloric diets were employed, the average weight loss increased in proportion to the degree of obesity. Diet alone resulted in better weight reductions than diet plus thyroid medication (group B), whereas diet plus amphetamine (group C) showed somewhat better results than diet alone. In the latter group there were striking appetite-reducing effects of amphetamine sulphate with considerable loss of weight. The initial effect often faded under continued administration of the drug so that with the same dosage of amphetamine, increased food intake and weight gain resulted; to avoid this in many instances the dose of amphetamine had to be gradually raised. Regardless of the form of therapy employed, best results were obtained in the first one or two months of treatment. Two instances of amphetamine poisoning were observed in psychoneurotic individuals who refilled the prescription for amphetamine sulphate on many occasions and raised the dose to toxic levels. Although no serious complications resulted in these cases, amphetamine may cause poisoning by uncritical use.

Patients A.W.O.L. M. R. STEINBERG AND J. PRIVER. *Hospitals*, 23: 46, April, 1949.

When a patient leaves a hospital against the advice of his physician, likely as not it is the fault of the hospital which, after making proper diagnosis, failed to convince the patient of the correctness and importance to him of the therapy prescribed for him—"a very necessary part of the whole art of the practice of medicine."

The article is based on a survey of premature departures at Mount Sinai Hospital over a two-year period (1947-48) which showed that over 50 per cent occurred because of resistance to surgery or to tests and examinations or because the patient thought further medical care useless.

Amino Acid Tolerance Tests in Children. H. ANFANGER AND R. HEAVENRICH. *J. Pediat.*, 77: 425, April, 1949.

Patients with cystic fibrosis of the pancreas, pancreatic achylia and the celiac syndrome and others convalescing from acute illnesses were given gelatin, protein hydrolysate, aminoacetic acid (glycine) and a combination of gelatin and aminoacetic acid orally, and the blood amino acid (amino nitrogen) levels were studied. Gelatin produced a good rise in the amino nitrogen level in all patients, except those with cystic fibrosis of the pancreas and pancreatic achylia, in whom a flat curve diagnostic of these diseases was obtained. Protein hydrolysate produced a good rise in amino nitrogen in all patients studied, but was discarded because of difficulty in administration and untoward reaction. Aminoacetic acid also produced a good rise in amino nitrogen in all patients, was easily administered without untoward reaction and was used to rule out the possibility of impaired absorption as the cause of a flat curve for amino nitrogen. A mixture of gelatin and aminoacetic acid, as used, produced curves for amino nitrogen which could not be employed to differentiate cystic fibrosis of the pancreas from the celiac syndrome.

Congenital Intestinal Atresia. E. E. JEMERIN AND C. R. HALKIN. *Ann. Surg.*, 129: 517, April, 1949.

A case is reported of high jejunal atresia and incompletely rotated colon in a premature (30 week) male infant, weighing $3\frac{1}{2}$ pounds. Other congenital defects were present in the form of closed fontanels and an embryoma of the right eye. Diagnosis was established by the clinical picture of vomiting, starting the day after delivery, and typical X-ray findings of the stomach, duodenum, and beginning of the jejunum, markedly distended by gas, with no gas seen in the remainder of the intestine. A thin barium mixture, given by tube, showed the passage of the mixture only to the beginning of the jejunum. At operation, the malrotated colon was first liberated. The proximal, dilated, blind end of the jejunum terminated about an inch beyond the ligament of Treitz, too short a segment to permit anastomosis. This technical difficulty was solved by reducing the proximal segment through the fossa of Treitz and a side-to-side jejuno-jejunostomy was performed. The post-operative course was smooth. The infant was discharged seven weeks after operation, weighing 6 pounds. The anterior fontanel had opened, and the general development seemed to be progressing favorably. The reported case was the smallest case on record in which a successful result was achieved.

Adrenotropic Receptors of the Human Skin. HENRY D. JANOWITZ, R. R. SONNENSCHN, AND M. I. GROSSMAN. *J. Invest. Derm.*, 12: 205, April, 1949.

Adrenergic receptor mechanisms have been recently classified by Ahlquist on the basis of responsiveness to sympathomimetic amines. In terms of this schema the adrenotropic receptors of the human skin associated with vasoconstriction and piloerection are of the *alpha* variety. Adrenotropic receptors for vasodilatation (*beta* variety) could not be demonstrated.

The Differential Diagnosis between the Early Infiltrate, or Tuberculoma, and Carcinoma of the Lung. ARTHUR H. AUFSES. *Tuberculology*, 10: 3, April, 1949.

The differential diagnosis between early tuberculous infiltrates or the older tubercu-

loma, and carcinoma of the lung is of great importance. If carcinoma of the lung is to be cured by surgery, the diagnosis must be made early. A period of observation in the belief that the disease may be tuberculous may permit both local and distant spread of a malignancy. The various diagnostic procedures which are available for the differentiation are discussed. A plea for the use of exploratory thoractomy in doubtful cases is made. The roentgenograms of 7 patients are shown to illustrate various phases of the problem.

Sigmoidoscope with Proximal and Distal Illumination. R. TURELL. *Surgery*, 25: 601, April, 1949.

To combine the advantages of both, the proximal and distal types of illumination, the author designed a sigmoidoscope containing both types of lights that can be used separately or simultaneously. The scope is described in detail and well illustrated.

Differential Diagnosis of Hiatus Hernia and Coronary Artery Disease. A. M. MASTER, S. DACK, J. STONE, AND A. GRISHMAN. *Arch. Surg.*, 58: 428, April, 1949.

The differential diagnosis of hiatus hernia and coronary artery disease is of great practical importance, since hiatus hernia may produce symptoms simulating angina pectoris and occasionally acute coronary occlusion. The two conditions, which occur with increasing frequency in the same age group, may coexist; therefore, the finding of one does not exclude the other. Hiatus hernia and coronary artery disease can be distinguished from each other, and when they coexist the clinical importance of each can be properly evaluated. This study emphasizes the value of the two-step exercise test, in the differentiation of these two conditions. A positive reaction to the two-step test may be the only objective sign of coronary artery disease.

A SPECIAL FUND IN MEMORY OF

Dr. Albert A. Berg

A contribution was made to the Journal of the Mount Sinai Hospital as a token of devotion to the departed great surgeon and humanitarian. It is to provide recent graduates of this Hospital with a free subscription to this Journal.

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THE IMPORTANCE OF LABORATORY DATA IN THE TREATMENT OF SURGICAL INFECTIONS BY ANTIBIOTICS

WITH PARTICULAR REFERENCE TO THE SYNERGISTIC ACTION OF
PENICILLIN AND BACITRACIN*

FRANK L. MELENEY, M.D., BALBINA A. JOHNSON, B.A., AND PAUL TENG, M.D.**

INTRODUCTION

The subject which we have undertaken to present this evening may seem to some of our friends at Mount Sinai to give us the opportunity to justify our own professional careers, in which we have tried to maintain the closest possible association between laboratory and clinic in the study and treatment of surgical infections.

We speak of the first two years of medical school as the "pre-clinical years," believing that the subjects taught and the knowledge acquired build the foundation upon which our subsequent knowledge and experience in the last two years of medical school, nay more, our whole future clinical experience, is built. In some institutions this division between pre-clinical and clinical courses is very sharp and those who teach confine themselves closely to their own subjects. They build no bridges nor do they consider any cooperative program by which the student can see the connection between theory and practice. In some medical schools, however, an attempt is made to give the students, in their first two years, frequent glimpses into clinical problems, so that their interest may be stimulated and the real meaning of their earlier courses may be more fully understood.

Thirty or more years ago, Hans Zinsser, then Professor of Bacteriology at Columbia University, had this matter on his heart and mind, when he tried to put his teaching of bacteriology on a practical basis and attempted to arouse the interest of physicians, surgeons, and gynecologists in the subject of bacteriology as applied to their particular problems. This idea fell upon the sympathetic ears of Allen Whipple, then being groomed for the direction of the Department of Surgery. One of us (F.L.M.) returned just at that time from the first World War with a keen interest in the problems of surgical infections, which caused such great havoc among the wounded and often brought to naught the best technical procedures of the surgeons. It was the idea of both Dr. Zinsser

* From the Department of Surgery, Laboratory for Bacteriological Research, College of Physicians and Surgeons, Columbia University, and the Surgical Service of the Presbyterian Hospital, New York, and the Department of Neurosurgery, delivered at The Mount Sinai Hospital, New York, February 21st, 1951.

** Some of the laboratory work reported in this paper was supported, in part, by a grant from the Dazian Foundation for Medical Research.

The bacitracin, used in the cases reported, was produced by the Commercial Solvents Corporation of Terre Haute, Indiana, and by Charles Pfizer and Company of Brooklyn, New York.

and Dr. Whipple, that problems of surgical infection should be tackled by one who had had a fundamental training in surgery and subsequent training in bacteriology, rather than by one whose primary training had been in fundamental problems of bacteriology and immunology. For that reason, in the Surgical Department at P & S, a laboratory was set up for bacteriological research, intended to be a link between the two departments, but primarily concerned with immediate problems of infection that were constantly appearing in the wards and clinics of the Surgical Department. As a matter of fact, it was recognized at that time that the intricacies of immunology had little relation to the problems of surgical infections, because the organisms, producing surgical infections, were those which caused a local destruction of tissue or a local exudation of leukocytes, and these organisms did not arouse any immunological response on the part of the body. There was, to be sure, some evidence that local immunity might develop in the area of infection, but this was of secondary importance and in most cases it was necessary to remove the focus of infection or a large portion of it by some surgical procedure, leaving to the local tissues the destruction of residual organisms and the repair following the surgical trauma.

If we go back to the early days of bacteriology, it must be remembered that Pasteur, who first demonstrated the association of bacteria with fermentation and putrefaction, was not a doctor and his ideas were not received sympathetically by his medical contemporaries. It was not until Lister, a practicing surgeon, became acquainted with Pasteur's work and saw its significance that the importance of bacteriology to surgery was made known. Even then it was almost a quarter of a century after Lister had started his first practice of bacteriological control, that his principles became generally accepted. Only then was it possible for surgery to expand into fields in which postoperative infections were matters of life and death. Only when these infections could be avoided was it possible for surgeons to carry out prolonged procedures in the inner recesses of the body.

Lister brought the science of bacteriology close to the art of surgery, but the very expansion of the field of surgery required a greater knowledge by the surgeon of the details of anatomy and a longer period of training in operative techniques. Therefore, in the late decades of the nineteenth and the early decades of the twentieth century, surgery and bacteriology tended to drift apart and surgery forgot all about its debt to bacteriology. It was Zinsser and Whipple's plan to bring them together again.

Zinsser said: "The development of modern medicine toward increasing precision of diagnosis and therapy is, to a large extent, due to well-organized co-operation of laboratory and clinic. Today there is a continuous flow of principles and methods from the fundamental sciences into the applied science of human biology. And the channels that direct this flow are the so-called pre-clinical laboratories of medical schools. These laboratories thus fulfill the function of carrying the newer knowledge of chemistry, physics, and biology into medicine and of transmitting it, in utilizable form, to the clinical investigator. It is the obligation of meeting these responsibilities that has converted such formerly purely medical laboratories into organizations in which fundamentally trained

scholars can collaborate with colleagues of more specific medical orientation It would seem, therefore, that a satisfactory system has been set up whereby medical scholarship can be constantly transfused with the advances of all applicable scientific discoveries."

So in 1925 the Laboratory for Bacteriological Research in the Surgical Department of P & S was organized to forge that link. It has been an important function of this laboratory to check the processes of sterilization, to search out and find the portals through which bacteria may enter the operating room and subsequently contaminate the sterile field. In the course of time, by diligent search, means were found to close the doors through which contamination of operative wounds took place, and the incidence of wound infection in clean cases was reduced to a minimum.

It was essential that such a laboratory should have at its command all of the methods of bacterial cultivation and classification. In this way, and by making routine anaerobic as well as aerobic studies of infectious exudates, the bacterial etiology of certain unusual infections was discovered. The discovery of the etiological agents in these infections necessitated an effort to find out how they might be specifically treated. This led, as some of you know, to the discovery of the therapeutic value of zinc peroxide, which kills anaerobic bacteria almost on contact and inhibits the microaerophilic organisms and many of the aerobes, without in any way injuring the tissues. By repeated trials and errors, measures were found to bring certain of these infections under control, but still the major problems of streptococcal and staphylococcal septicemia and peritonitis remained unsolved.

As I have said above, the bacteria which cause surgical infections are those in which the body has little or no power to build up an immunity. For that reason it was obvious that it would be necessary to turn toward chemotherapeutic agents, to find any adjuvants that might be depended upon either to obviate surgery or to cut short the period of wound healing after the surgical procedure in the treatment of surgical infections.

In the early days of bacteriology many efforts were made to find some chemical agents which would destroy bacteria without injury to the tissues. It was the intensive laboratory researches of Ehrlich, Hata, Kitasato, Browning, and others that led to the discovery of the arsenicals and the aniline dyes. Clinical application of these agents, however, demonstrated that they were too frequently harmful to the body as a whole or to some of its organs, particularly the kidneys and liver. Even locally they had an inhibiting effect upon the leukocytes, so they fell into disrepute. However, as you know, further intensive laboratory work by Domagk in Germany finally led to the discovery of an azo dye which was of low toxicity and high antibacterial potency. It was called prontosil. This was further purified to diminish its toxicity and the active principle was found to be sulfanilamide.

It was not long before a competent observer in this field, Dr. Leonard Colebrook, who had been a co-worker with Fleming under Sir Almoth Wright, made clinical application of this laboratory discovery. (On his recent trip to America,

Dr. Colebrook told us that he considers Sir Almuth Wright an even greater man than Lister, but Sir Almuth's contributions were in the field of immunology, while Lister's work was more directly applicable to the province of surgical infections.) Colebrook had the unusual opportunity of having under his care all of the cases of puerperal fever in the city of London, which were brought together at Queen Charlotte's Hospital. He proceeded to apply sulfanilamide to this problem. He would not have been able to come to any definite conclusions on clinical grounds alone, but by thorough laboratory studies in connection with the clinical studies, he was able to show that the serum of these patients following the administration of sulfanilamide had a greatly increased bactericidal action which inhibited the growth of the streptococci concerned, *in vitro* as well as *in vivo*. He was then able to prove, beyond the shadow of a doubt, that the administration of sulfanilamide materially reduced morbidity and mortality in puerperal fever by percentages which were statistically significant.

In an extraordinarily short time sulfanilamide was applied first to other hemolytic streptococcal infections and then to infections due to other organisms, where its effectiveness was less clearly demonstrated. However, the momentum of its popularity and the fact that it was the first of the antibacterial agents which was cheap, easily available, and relatively non-toxic, led to its indiscriminate use even in cases which were not infections at all. It was not uncommon to hear doctors say, "I did not know what he had, so I gave him sulfanilamide." The use of this drug did, however, effectively control hemolytic streptococcal septicemia of all types, and the discovery of some of its derivatives, sulfapyridine and sulfadiazine eliminated the terror of pneumococcal pneumonia. But staphylococcal infections, and particularly staphylococcal septicemia, continued to rage and baffle all efforts toward control.

While working with bacteriophage in the treatment of staphylococcal infections, a constant check by the laboratory of the results obtained in clinical cases gave us an almost immediate indication that some lots of bacteriophage were much more active than others and some were completely inactive. In searching for an explanation of this discrepancy, it was soon found that the ineffective lots, while they cleared the culture, did not prevent growth when the cleared culture was transplanted to blood agar plates, while the effective lots did so. The favorable results obtained with the "doubly potent" bacteriophage, both in the treatment of local staphylococcal infections and in septicemia, were apparent almost at once. But bacteriophage could not be successfully prepared on a commercial scale, and it was not long before an antibacterial agent far superior to it for the control of staphylococcal infections was discovered—penicillin.

Ten years before, in 1927, Fleming had observed the effect of the colony of *Penicillium notatum*, which accidentally contaminated his old staphylococcal culture, and he conceived the idea that such an agent, if purified, might be effective in the control of staphylococcal infections. But he did not have the close contact with clinical medicine which would have permitted an immediate utilization of the discovery. As a matter of fact, the renewal of interest in peni-

cillin was stimulated by the war and by the failure of the sulfonamides to measure up to expectations in the control of infection in war wounds. This led to the search for another agent which might prove more effective. The early clinical results with penicillin demonstrated the need for greater production, so the problem was tossed back from the clinic to the laboratory for its solution. It is not generally realized that in the production of penicillin \$60,000,000 was spent by the combined resources of the War Production Board, the Department of Agriculture, and sixteen or seventeen commercial firms, before penicillin was made available for the Armed Forces. Fortunately, this occurred just at the time of the Channel crossing of the Allied troops into France.

The success of penicillin opened up an entirely new field of research, but it was soon discovered that, while penicillin had an extraordinary range of antibacterial activity, it was not a panacea. Therefore, it was not long before every laboratory of any size in the country began a feverish search for other antibiotics which might succeed where penicillin had failed.

Waksman and his co-workers were struggling along with limited resources, studying the bacteria of soils for the benefit of agriculture, and the soil seemed to offer a fertile field for indications of bacterial antagonisms. Out of this study came the second important, relatively non-toxic antibiotic—streptomycin. Again the laboratory depended upon clinical observation on the part of many workers to determine the indications for, and the limitations of, this new antibiotic. When certain toxic effects were found, again the problem was turned back to the laboratory to see if the difficulties could be solved by careful chemical studies.

Bacitracin was the third important antibiotic to be discovered, when it occurred to us to search for evidences of bacterial antagonism in the prolific flora of severely contaminated civilian accidental wounds. Some of the early lots of bacitracin, made by the deep tank method, proved to be toxic when administered systemically and the presently available material must be limited in dosage when given intramuscularly. However, the laboratory is working hard on further purification and recent studies indicate that the toxicity may be materially reduced, permitting a wider dose range. Bacitracin is often successful in the treatment of cases which have failed to respond to penicillin, because of its wider antibacterial spectrum and because it is bactericidal as well as bacteriostatic and is not inactivated by secondary contaminating organisms.

Thus it is seen in the whole history of the treatment of infections, the ball was tossed back and forth between the clinic and the laboratory and the greatest progress was made when they worked closely hand in hand.

But you will say, "Why bring up all of this ancient history? We admit that the laboratory researches of Pasteur, of Ehrlich, of Colebrook, of Fleming and of Waksman have all resulted in important progress in our understanding and control of infections. But how does the laboratory help the clinician in his day-to-day problems of surgical infection?" It is our purpose this evening to answer that question.

Although in the last ten years there has been a much greater advance in the

control of infections than in any previous decade, bacteria still find it possible to gain a foothold in the body, and in many cases they are not brought under control—often resulting in prolonged disability and death.

We now have six antibiotics which have demonstrated their ability to bring various types of infection under control, when given in doses which are clinically effective, without being injurious to the organs, tissues or vital functions of the body. These are penicillin, streptomycin, bacitracin, aureomycin, chloromycetin and terramycin.

If any one of these were a panacea, we would be justified in using it in all kinds of infections without determining the cause of the infection, but such is not the case. Each of these antibiotics has its indications and limitations, and the highest degree of success in the treatment of infections depends upon the intelligent application of all of our knowledge of each of them. One fact that we must keep clearly in mind is that from year to year, the number of strains of staphylococci found to be resistant to penicillin is steadily increasing, so that if penicillin is given empirically in any given infection, without determining the causative organism and its sensitivity, the chances of successful treatment are steadily decreasing.

RATIONALE

Many times the clinician uses one or more of the antibiotics empirically, not to say indiscriminately, in the treatment of a given case of illness which he assumes to be due to the invasion of microorganisms. He fails to utilize any bacteriology laboratory to find out what the invading microorganisms are and whether they are susceptible to the antibiotic or antibiotics that he has at his command. If the case fails to respond to the antibiotic that the clinician first uses, he may try increasing the dosage or adding a second or a third antibiotic. The patient nowadays not only expects the doctor to use one or more of the so-called "wonder drugs," but expects him to know which one to use and how it should be administered.

My contention is that the clinician cannot properly or intelligently treat cases of infection unless he knows which one or which combination of antibiotics will most promptly stop the activity of the invading microorganisms. This can only be determined by the employment of laboratory procedures that are directed toward the isolation of the offending microorganism and the determination of its susceptibility to all of the available antibacterial agents and by tests to find out whether it produces any inactivating substances that will render any or all of the antibiotics impotent.

It is true that the astute and experienced clinician can often guess the probable species of bacteria producing certain clear-cut clinical categories of infection. This is probably more accurately done by the internist than by the surgeon, because medical infections are more often due to a single species while surgical infections are usually due to a mixture of microorganisms. For example, the internist may quickly decide that a patient with a cough, a pain in the chest, a chill, and a high fever has an acute pneumococcal pneumonia. On the other

hand, an extensive chronic ulcer of the leg may look like any other ulcer and yet harbor a host of different pathogenic microorganisms all of which may play a role in the persistence or nonhealing of the wound.

The authors have frequently tried to predict what microorganism or microorganisms would be found on culture from any given surgical infection which arose either spontaneously without any apparent break in the skin or from a trivial or extensive wound. Certain microorganisms in pure culture have certain invasive attributes which produce certain reactions at the portal of entry and in the course of their spread into and through the body, but these effects vary with different strains and in different individuals, and if there are associated microorganisms, there are often synergistic or antagonistic effects which modify the spread of the infection and the reaction of the body to it. Under these circumstances, any prediction, by even the most experienced clinician, of what the incitant or incitants may be in any given infection, is merely a guess. The authors have, therefore, given up trying to predict and depend on the laboratory to tell him what the microorganisms are.

METHOD

When the doctor first sees the patient, cultures should be taken as soon as possible and before any antibiotic is given. Specimens of blood should be taken for culture, if the temperature is 101°F. or over. The cultures should be incubated both aerobically and anaerobically. Surface exudates from wounds or ulcers may be taken up on a sterile cotton swab. Exudates in a body cavity, such as the pleura, the peritoneum, or a joint space, or in an abscess cavity, may be obtained by aspiration. Cultures may be obtained from areas of cellulitis by injecting 1 ml. of nutrient broth into the center of the area and immediately reaspirating as much of it as possible. Usually from 0.1 to 0.2 ml. can be recovered.

Material on swabs, exudate, or fluid, thus obtained, should be sent directly to the laboratory and some of the material spread with a nichrome spatula on the surface of two blood-agar plates, one for aerobic and the other for anaerobic cultivation. The rest of the specimen should be planted in a tube of dextrose cooked-meat medium. Before incubation, on each plate a small square or circle of filter paper is placed, each one being wet with a solution of one antibiotic. We use penicillin in a concentration of 2 units per ml.; bacitracin, 20 units per ml.; terramycin, 100 micrograms per ml.; and streptomycin, 250 micrograms per ml. This disparity in concentrations is due to the relative differences in diffusibility in blood agar of these four antibiotics. It has been found in general that, if microorganisms show a resistance to these concentrations on the blood-agar plate, no amount of systemically administered drug will be able to control the infection. A somewhat more accurate determination of sensitivity may be made either with the primary culture or at a later time with pure cultures of each microorganism recovered, by using varying concentrations of each antibiotic on a plate by itself. One half of 1 ml. of a young broth culture is deposited on the surface of a blood-agar plate and spread evenly over the surface with a

nichrome spatula. The surface is allowed to dry in the incubator and a series of five or six penicylinders are applied to the surface, and the antibiotic in varying concentrations is delivered to the penicylinders. For example, with penicillin the concentrations may run 10, 5, 2.5, 1.25, 0.65, and 0.3 units per ml.; with bacitracin, 50, 25, 5, 2, 1, 0.5 units per ml.; with streptomycin, 250, 125, 25, 10, 5, 1 micrograms per ml.; with terramycin, 200, 100, 50, 25, 5 micrograms per ml. Comparison with a stock strain will give some idea of the relative susceptibility or resistance of the culture being studied. Still more accurate determinations of inhibition can be obtained with the pure cultures in a series of test tubes. Such a determination is necessary for aureomycin and chloromycetin because of the rapid deterioration of these antibiotics when they have been put into solution. A five-hour turbidimetric test is the most reliable yet devised.

If the culture is susceptible to only one of these drugs, that drug is indicated for the treatment of the case. If it is susceptible to two or more, one of them may be selected or the two or more may be combined in the treatment. If the microorganism is resistant on the plate to all of these antibiotics, the inhibiting concentrations for each may be determined by dilutions ranging from 100 units per ml. downward in fluid media. Frequently a synergism between two or more of the antibiotics may be demonstrated, whereby fractions of minimal inhibiting concentrations, when combined, will inhibit the growth of the microorganisms.

The director of the laboratory should be given whatever details of the clinical history may be necessary to suggest the causative agent. At times special media may be advisable. The request for a culture should be a request for consultation on the case. It is better still if the laboratory worker takes the time and interest to see the patient. This will give him a greater feeling of responsibility for making an early diagnosis, in order that the proper treatment may be instituted as soon as possible. A preliminary report may be made on the result of an examination of the stained film of exudate, and in any case after an overnight incubation of the culture. This may modify the original intention of the clinician as to the initial therapy or may change it on the second day. In many cases it is advisable to repeat culture studies at frequent intervals after treatment has been instituted to check its efficacy or to indicate any modification of it.

If such a program is not carried out, the patient will not derive the full benefit of our knowledge and experience and the result may be prolonged or permanent disability with its resultant cost in time, money, and impaired health or even death. If such a program is carried out, in the vast majority of cases the infection will come under control promptly, and the patient will be rehabilitated quickly and saved from an excessive drain upon his physical and financial resources.

CASE REPORTS

During our recent studies on the efficacy and safety of bacitracin we have treated many cases which illustrate the points brought out above. A few case histories, summarized briefly, will serve to emphasize what we believe to be the wrong way and the right way of handling surgical infections with the aid

of the laboratory. Some of these cases were treated in the wards and the private pavilion of the Presbyterian Hospital and some are from the Medical and Neurosurgical Services of The Mount Sinai Hospital.

Case 1. E. McC.—This patient was sent down from Toronto. She had had a series of infections in the region of the right buttock and the inner surface of the right thigh and vulva for a period of three years. She had had numerous operations, including plastic repair about a year previous to admission, and this seemed to clear up the whole affair, but after six months there was a recurrence of the infection on the inner surface of the upper thigh and in an independent area between the vulva and rectum. These areas continued to discharge pus in spite of surgical treatment augmented by penicillin, aureomycin, streptomycin and deep x-ray therapy.

On admission to the hospital, the lesion had the typical appearance of an undermining burrowing ulcer. Cultures revealed a hemolytic streptococcus, probably of the microaerophilic variety, which was susceptible to penicillin and bacitracin, and a hemolytic *Staphylococcus aureus*, resistant to penicillin, but susceptible to bacitracin. There was another secondary contamination with *B. proteus*. The first dressing of the wound was with bacitracin alone, but when *B. proteus* was reported in the culture, 0.25% parachlorophenol was added to the local treatment. She was given bacitracin in a dosage of 20,000 units every eight hours intramuscularly and bacitracin was applied to the undermined recesses of the ulcerated areas on fine meshed gauze and sealed with zinc oxide ointment gauze. The skin margins soon began to seal down, granulations became pink and flat, the upper ulcer healed within a few days, and on the seventh day after admission, twenty-five deep Davis grafts were taken from the left thigh and planted on the granulating surface. All but one of these grafts remained in place and retained its viability. By the seventh postoperative day they had become fused. The patient was discharged on the ninth postoperative day with the wound practically healed.

Comment. This case illustrates the response of an undermining burrowing ulcer to the systemic and local use of bacitracin and to the combination of parachlorophenol with bacitracin, when a secondary contaminant like *B. proteus* was present. In this case surgery was obviated.

Case 2. W. K.—Ten days before admission this boy cut his left index finger with a sickle. It bled profusely and he went to his local doctor, who cleansed the wound and closed it by suture. He gave the patient tetanus antitoxin, but no antibiotic. Two days later the finger became swollen and painful and the patient was taken to a Long Island suburban hospital. The stitches were removed, but the inflammation did not subside. Penicillin was given, but it had no effect and the edges of the skin wound gradually became necrotic. Cultures showed a heavy growth of Welch bacilli. Wet dressings were applied, but the infection continued to spread, and necrosis of the skin extended outward in all directions. Local trimming of the dead skin did not bring the infection under control. The boy is a clarinet player and was greatly disturbed about the possibility of interference of this avocation from the loss of a finger. He was referred to the Presbyterian Hospital for further treatment.

On admission, there was some swelling of the proximal phalanx of the left index finger and the contiguous portion of the hand. On the radial side of the finger there was an ulcer extending down to the periosteum of the middle phalanx and overlapping the middle interphalangeal joint proximally and the distal joint distally. Anteriorly, it extended almost to the midline, exposing the flexor tendon sheath but not the tendon itself. The surface of the ulcer was covered with a grayish exudate and some superficial slough. Cultures were taken, which revealed *Cl. welchii* susceptible to bacitracin, only slightly susceptible to penicillin, and resistant to streptomycin, also a nonhemolytic streptococcus susceptible to bacitracin but resistant to the other two, and *E. coli* susceptible to streptomycin. He was given 10,000

units of bacitracin intramuscularly every eight hours and local bacitracin was applied on China silk to the surface of the wound in a concentration of 1,000 units per cc. This was kept moist by covering it with zinc oxide ointment gauze. Dressings were changed daily. Systemic bacitracin was continued for a week and local bacitracin for twelve days. After the third day, when the culture revealed a contaminating colon bacillus, streptomycin and sulfamylon were added to the local bacitracin, being mixed with it in equal parts. There was never any extension of the process. *Cl. welchii* was present for only two days after the treatment was started. The wound rapidly cleaned up. On the fifth day the cultures showed no growth. Granulations rapidly appeared all over the surface of the wound. He was sent home and the wound was grafted about two weeks later.

Comment. This instance illustrates the prompt control of a gangrenous mixed infection containing *Cl. welchii*, by systemic and local bacitracin and the addition of other appropriate medication, when indicated by culture reports.

Case 3. G. P.—Fifteen months before admission this patient had sustained a chemical burn of the hand from a combination of nitric and sulphuric acids in glass containers. A typical burn resulted all over the dorsum of the hand, but it was not realized until later that a small piece of glass, which cut the extensor tendon, had penetrated the hand in the region of the middle metacarpophalangeal joint. An abscess formed in this region, and several attempts were made to bring this infection under control by surgery. The piece of glass came out after one of these operations, but the wound continued to drain. During the course of the next year the finger became increasingly stiff, and because of the probability of a useless finger, even if the infection could be controlled by removal of the infected tissues, he was advised to have an amputation. It was found that the dorsal surface of the metacarpophalangeal bone was involved in the infectious process. The cut ends of the tendon were not exposed and had become sealed off. Cultures revealed a hemolytic *Staphylococcus aureus*, resistant to penicillin but susceptible to bacitracin, streptomycin and terramycin.

The finger was amputated, including the head of the metacarpal bone, and a long anterior flap was left, utilizing the skin over the proximal and middle phalanges of the finger. The wound was tamponed with China silk after being flooded with bacitracin solution containing 1,000 units per cc. Packing, wet with the same solution, was used within the silk tampon. He was also given 10,000 units of bacitracin intramuscularly, every eight hours. There was no exudate whatsoever. The wound remained clean, and on the second postoperative day the culture showed no growth. On the third day, therefore, a late primary closure was done by bringing up the anterior skin flap and suturing it to the dorsum of the hand. The wound healed by primary union without any evidence of infection. The patient left the hospital on the ninth postoperative day with the wound clean and all stitches out. Systemic bacitracin was continued every eight hours for the whole period of his hospital stay, and there were no clinical signs of nephrotoxicity.

Comment. This case serves to illustrate the possibility of a late primary closure of a wound after excision of the infected tissue, when accompanied by the systemic administration and by the local application of bacitracin. The negative culture on the second postoperative day indicated that the wound closure would be successful.

Case 4. W. B.—Five years before admission, this patient had suffered a compound fracture of the left tibia in an airplane crash. Infection developed and continued in spite of various kinds of local and systemic treatment, including penicillin. Three years after the accident an attempt was made to remove the dead bone, but the wound did not heal and a profuse drainage continued up to the time of admission, when there was a small sinus open—

ing extending down into the medulla of the tibia directly below the knee joint. Culture revealed a hemolytic *Staphylococcus aureus* susceptible to penicillin, bacitracin, streptomycin and terramycin. The diseased bone was excised with a comfortable margin, leaving a freshly bleeding, relatively normal looking, bony surface. This was flooded with bacitracin solution containing 1,000 units per cc., and tamponed with China silk, filled with packing, wet with the same solution. The packing was removed daily and the tampon lightly repacked with 1-inch gauze bandage, wet with bacitracin. He was also given 20,000 units of bacitracin intramuscularly, every eight hours. On the fifth day, granulations could be seen through the silk tampon. On the seventh postoperative day the culture showed no growth. The tampon was removed on the ninth day, at which time granulations were present all over the bony surface, except at one point where the bone was particularly dense in the region of the crest of the tibia. The wound continued to granulate satisfactorily until the fifteenth day, when a green color betrayed the presence of pyocyanus. This was not controlled in two days with parachlorophenol, but did respond promptly in forty-eight hours to polymyxin, which was added to the bacitracin solution and instilled daily into the bony cavity. On the twenty-first day the surface was covered with deep Davis grafts taken from the thigh and every graft obtained its circulation. The wound was completely healed on the twelfth day, when the patient was discharged from the hospital with the wound dusted with zinc peroxide powder. This patient had some nausea which was attributed to the bacitracin, but this was considerably relieved by dramamine, and there was no occasion for stopping bacitracin treatment. However, on the eighteenth postoperative day the amount was reduced to 10,000 units every eight hours, and it was stopped on the second day after the skin graft. Local bacitracin was continued until the eleventh day following grafting.

Comment. This case illustrates the possibility of controlling chronic osteomyelitis by the use of systemic and local bacitracin after removing the diseased portion of bone, packing the cavity with a silk tampon, leaving the silk in place until the surface of the bone is covered with granulation tissue, and then covering the defect with skin grafts. The value of a laboratory check-up during the course of treatment is clearly demonstrated by this case, because it revealed a secondary contaminant, which was then brought quickly under control by the addition of the appropriate antibiotic.

Case 5. E. R.—This patient had had an extraordinary infection starting as a pansinusitis and extending into both orbits, destroying both eyes and most of the small facial bones surrounding the nasal sinuses. After five separate series of treatments with penicillin and further efforts with streptomycin and aureomycin without effect over a period of three years, it was found that the organisms were resistant to these drugs but susceptible to bacitracin. When this was applied to the infection, it finally came under control and it became possible to cover the cavity with skin grafts. However, the infection remained latent in the residual sinuses of the ethmoid, sphenoid and frontal regions, and after a year, during which time the patient became well adjusted to her blindness and acquired a Seeing-Eye dog, the infection flared up again and produced extensive infection in the surrounding bones and caused ulceration and destruction of the previous skin grafts.

It was decided to bring the patient into the hospital and remove as much as possible of the infected tissue and later attempt another skin graft, if the infection could be brought under control. The original organism was a microaerophilic hemolytic streptococcus, and the lesion had the characteristics of undermining burrowing ulcers, with undermined rolled-in margins. On the last admission a hemolytic streptococcus was again found, probably a progeny of the original organism. *Staphylococcus aureus* was also present, which was susceptible to bacitracin and terramycin. She was put on 2 Gm. of terramycin and 64,500 units of bacitracin a day, and these antibiotics were also used locally. However, there was very little evidence of improvement, indicating that the drugs were not reaching the innermost

recesses of the infection. On the sixteenth day of hospitalization, therefore, she was taken to the operating room and all of the infected bone was removed, as well as the mucous membrane of the remaining cells in the ethmoid, sphenoid and right frontal sinuses and both antra, the left frontal sinus having been congenitally absent. This left a smooth bony surface. The cavity was tamponed with China silk and packed with gauze, wet with bacitracin and terramycin, and these antibiotics were continued systemically. Cultures then showed that the hemolytic streptococcus had disappeared and the staphylococcus had become resistant to terramycin, so the latter was discontinued. Granulations gradually appeared beneath the China silk and by the twenty-fifth day the patient was well enough to go home for the Christmas holidays.

Three days later she was readmitted, and the whole area was covered with deep Davis grafts taken from the thigh. Every graft was successful and the whole dome of the cavity was soon covered with good skin. However, on the floor of the wound one or two small islands of mucous membrane regenerated. Although these may give trouble later, she is getting along very well at present. She has gone home, has gained weight and strength, and seems to be completely rehabilitated.

Comment. This case illustrates the possibility of eradicating infection in the small bones of the face and in chronic sinuses by radical surgical removal aided by the local and systemic use of the appropriate antibiotics, as determined by the careful study of the cultures and tests for sensitivities in the laboratory.

Case 6. G. B.—This man of 52, of Armenian parentage, born on the island of Cyprus, had been in the United States for twenty-nine years. He came into the medical ward with a history of melena at the age of 19 and a recurrence of one month's duration. After the bleeding had ceased and the loss of blood had been replaced, and after he had responded to a medical regime, an x-ray study of the gastrointestinal tract revealed a large ulcer crater in the duodenum. After a stay of twelve days in the hospital, he was discharged with the promise to come back after six weeks for an elective gastrectomy.

The operation was done without unusual difficulty, except that there was some trouble with bleeding, when the posterior wall of the ulcer was dissected away from the pancreas. At the end of the operation it was found that there was a considerable amount of blood clot in the right lumbar gutter, over the dome of the liver and in the pelvis. This was removed by means of sponging and suction before closing the abdomen. The abdominal cavity was irrigated with 250 cc. of sulfamylon and streptomycin mixture, as a prophylactic against infection, and the area of the duodenal stump was drained and the wound closed with catgut. After operation he was started on prophylactic erythycin, 400,000 units twice a day, and streptomycin 0.5 Gm. every six hours. In spite of these measures his temperature ranged between 100° and 104°F. On the third day, streptomycin was stopped and aureomycin was given in a dosage of 0.25 Gm. every six hours, but this had no effect on the temperature. On the seventh day, when the fever rose still higher, terramycin was added in a dosage of 0.5 Gm. every six hours and streptomycin was re-instituted. But the temperature remained high. With x-ray evidence of a high right diaphragm with impaired movement and a small amount of fluid in the right costophrenic sinus, the diagnosis of subphrenic abscess was made. On the thirteenth postoperative day the right subphrenic space was opened and was found to contain about 300 cc. of dark fluid blood, culture of which revealed a hemolytic streptococcus which was resistant to penicillin, streptomycin and terramycin, but susceptible to bacitracin, and a hemolytic *Staphylococcus aureus*, resistant to penicillin, but susceptible to bacitracin, streptomycin and terramycin, and *E. coli* resistant to all. Aureomycin was given after operation in a dosage of 1 Gm. every six hours, and when the culture report was returned, bacitracin was introduced locally into the abscess cavity. On the fourth and fifth days streptokinase and streptodornase were also introduced locally, but in spite of these measures the temperature gradually took an upward course until it reached 104.8°F. on the seventh and eighth days. Because the patient did not seem to be as ill as this tem-

perature would indicate, it was decided to stop all antibiotics with the thought that the fever might be due to medication. However, the temperature continued to range between 101° and 104°F., and on the thirteenth day chloromycetin was given. This was equally ineffective and was stopped after three days. On the fifteenth day the chest was tapped and 150 cc. of thin serosanguinous fluid was withdrawn, but this failed to yield any bacteria on culture. On the seventeenth day, with the idea that there might be some undrained pocket under the diaphragm, the wound was enlarged and the whole upper surface of the liver was explored with the hand, without finding any retained pockets. On the next day, 900 cc. of slightly blood tinged fluid was aspirated from the chest and 400,000 units of penicillin were instilled, but the culture from the fluid yielded no growth. After the operation, penicillin was given, but this had no effect upon the temperature, which continued to range from 102° to 104.6°F. The general consensus of opinion was that a further exploration of the subhepatic area would be necessary.

However, on the basis of the culture reports and with the thought that the hemolytic streptococcus and *Staphylococcus aureus* were then the important organisms, bacitracin was given parenterally on the third postoperative day in a dosage of 20,000 units every eight hours. All other antibiotics were stopped. The temperature then gradually began to decline and reached normal on the twelfth day. Bacitracin was continued for eighteen days thereafter and the patient left the hospital on the thirty-second day after the third operation, but two months after the gastrectomy.

Comment. This case illustrates the development of infection in extravasated blood within the peritoneal cavity in spite of the prophylactic use of streptomycin and sulfamylon locally, and penicillin and streptomycin systemically. The laboratory had reported on the culture, but the clinicians had failed to take cognizance of it and empirically tried out aureomycin, chloromycetin and terramycin without effect. When the antibiotic which was indicated was actually employed, the patient responded fairly promptly. The clinicians all agreed that the bacitracin had brought the infection under control and that it should have been used as soon as the laboratory had turned in the report. This would probably have saved the patient from a considerable period of disability and from financial depletion.

Case 7. P. R.—For ten years before admission the patient had had repeated attacks of ear pain associated with severe headaches. During each attack a thick whitish discharge drained from both ears. Two days before admission the patient began to have pain in the right ear, the head and the back of the neck. On the following day he had chills and fever. He was then given one injection of penicillin, 300,000 units intramuscularly. Twelve hours later he became incoherent in speech, lethargic and restless, and complained of intolerable headache. He vomited repeatedly.

On admission to the neurological service of the Mount Sinai Hospital, the patient was found to be acutely ill, semi-stuporous and restless. He could neither understand nor answer simple questions. The neck was markedly rigid. Brudzinski and Kernig's signs were elicited bilaterally. Shortly after admission, the patient went into coma and reacted only to painful stimuli. A lumbar puncture was immediately done and cloudy cerebrospinal fluid was obtained, which was under a markedly increased pressure and which contained 6,100 neutrocytes per cmm. Culture and direct smear of the cerebrospinal fluid disclosed a pneumococcus Type V.

Immediately after the diagnosis of pneumococcic meningitis had been established, the patient was given 100,000 units of crystalline penicillin intramuscularly and 4 gm. sulfadiazine through a superficial vein. Five hours later his unconsciousness was further deepened and because of the severity of the infection, it was decided to use bacitracin.

Thirty thousand units of this antibiotic in 6 cc. of normal saline were injected into the lumbar subarachnoid space. The intrathecal therapy was supplemented with systemic bacitracin 20,000 units every six hours, and procaine penicillin, 300,000 units four times a day. His temperature rose to 106°F. in the late afternoon but dropped to 102°F. two hours later. Twelve hours after the intrathecal injection of bacitracin he could be aroused by calling his name. He became restless and had to be restrained. Nevertheless, he could answer simple questions. In the evening he received the second dose of intrathecal bacitracin, 10,000 units in 4 cc. of physiological saline.

On the third day after admission the cell count of the cerebrospinal fluid dropped to 2,040, the pressure was 280 mm., and the total protein was 186 mg. per cent. Twenty thousand units of bacitracin were instilled into the lumbar spinal canal and this was repeated on the fourth and on the fifth day. The systemic dosage of bacitracin was increased to 20,000 units every four hours instead of every six hours.

Two days later, on the fifth day after admission, he was fully alert. He recognized for the first time that he was in a hospital and he answered questions accurately. On the following day the left homonymous hemianopsia and the Babinski sign all disappeared. The left hemi-hypesthesia and hemiparesis were markedly improved. He was then given the last intrathecal injection of bacitracin, 10,000 units. On the next day he sat up in a chair. His temperature was normal and remained so thereafter, and his convalescence was rapid.

Comment. This case illustrates the effectiveness of bacitracin-penicillin therapy in pneumococcic meningitis. The pneumococcus that infected the cerebrospinal fluid was found to be sensitive to sulfadiazine and to all available antibiotics, including penicillin, bacitracin, chloromycetin and aureomycin. However, there was no response to large doses of penicillin and sulfadiazine. When bacitracin was added to the therapy, both intrathecally and intramuscularly, not only did the meningitis rapidly clear up, but also the cerebritis involving the right temporo-parietal region, which might have resulted in a brain abscess.

Case 8. T. B.—This man of 60 had received radiation therapy more than twenty years before admission for a hemangioma of the scalp. Subsequently the tumor continued to grow and he was given further radiation. Seven months before admission the irradiated skin became necrotic and infection ensued.

On admission to the neurosurgical service of The Mount Sinai Hospital an ulcer, surrounded by a paper-thin scar, was found to be present in the right frontal region of the scalp with bare bone at the base. The scar was removed, together with the underlying infected bone. Beneath the bone, external to the dura, a small abscess was found and evacuated. The wall of the abscess was curetted and 20,000 units of bacitracin and the same amount of penicillin were instilled into the wound, which was then closed by means of a pedicle flap from the temporal region. Culture yielded a *Staphylococcus aureus*, twenty-five times as resistant to penicillin and ten times as resistant to bacitracin as the stock cultures, but unusual synergism by these antibiotics was demonstrated in that $\frac{1}{32}$ of the inhibiting dose of penicillin plus $\frac{1}{8}$ of the inhibiting dose of bacitracin inhibited the growth of the organism *in vitro*. After operation the patient was given 10,000 units of bacitracin every six hours and 300,000 units of penicillin twice a day for eight days. The wound healed by primary union and the stitches were removed on the tenth day. Four days later a little serous discharge leaked from one corner, but the culture was negative. Ten thousand units of bacitracin and the same amount of penicillin were instilled into the wound four times and then the wound healed completely.

Comment. This case illustrates the importance of testing a resistant organism against a combination of bacitracin and penicillin, for there is often a synergistic action which can be successfully utilized for the control of the infection.

Case 9. R. R.—This woman of 46 had been a known diabetic for ten years. One year before the present admission she had had an ependymoma removed from the right frontal area. The operation left her with a moderate residual hemiparesis. One week before admission she fell out of bed and injured her right foot, which became infected. Three days later she developed nausea and vomiting, with fever of 103°F. and a stiff neck.

When she was admitted to the neurological service of The Mount Sinai Hospital, she was mentally cloudy and showed marked neck rigidity, a left hemiplegia, and a positive Kernig's sign. A lumbar puncture yielded cloudy fluid containing Gram-positive cocci, which on culture proved to be a *Staphylococcus aureus*. A blood culture yielded the same organism. This proved to be ten times as resistant to penicillin, three times as resistant to streptomycin, five times as resistant to aureomycin, twenty times as resistant to chloramphenicol as the stock cultures, and very susceptible to bacitracin, 0.08 units per cc. inhibiting growth *in vitro*. With the first lumbar tap, 10,000 units of bacitracin in 5 cc. of saline were instilled into the subarachnoid space and this was repeated daily for fifteen days. Ten thousand units of bacitracin were given intramuscularly every six hours and continued for thirty-nine days. Penicillin, 600,000 units, was given every twelve hours for twenty-eight days and streptomycin 0.5 Gm. every six hours for twenty-six days. Improvement was slow, but steady. The diabetes complicated the picture and was difficult to control. The meningitis cleared completely in two weeks. The blood culture became negative on the fifth day, was positive again on the seventh, and negative again on the ninth. Thereafter the blood was sterile, and the temperature became normal after the fifth week.

Comment. This case illustrates the importance of testing sensitivities of the infecting organism early in the course of the disease. In this case of staphylococcus septicemia and meningitis, the organism was sensitive to bacitracin and resistant to all of the other antibiotics. Synergism was not tested in this case, but there can be little doubt that bacitracin was responsible for the patient's recovery.

Case 10. C. M.—This patient was admitted to the neurosurgical service at The Mount Sinai Hospital, where a laminectomy was performed and a herniated disc was removed. 300,000 units of penicillin were administered daily as a prophylactic, starting the day before operation and although, because of fever developing on the second postoperative day, the dosage was increased to 600,000 units, on the third day to 900,000 units and on the fourth to 1,200,000 units, it became obvious on the fifth day that the wound was infected. It was opened and 20 cc. of thick pus was evacuated, yielding on culture a hemolytic *Staphylococcus aureus*. This was found to be fifteen times as resistant to penicillin and four times as resistant to bacitracin as the stock cultures, but $\frac{1}{5}$ of the inhibiting dose of penicillin plus $\frac{1}{5}$ of the inhibiting dose of bacitracin inhibited the growth of the organism *in vitro*.

Beginning on the fifth day, bacitracin was given intramuscularly in a dosage of 10,000 units every eight hours and the penicillin was reduced to 600,000 units. Bacitracin, 5,000 units, and penicillin, 10,000 units, were instilled into the wound daily. The temperature promptly fell to normal. There was very little exudate from the wound, and it was completely healed two weeks after it had been opened.

Comment. This case illustrates the importance of testing for antibiotic synergism in an instance in which cultures seemed to be resistant to the individual antibiotics. The cessation of exudation, following the local and systemic use of effective antibiotics, is a characteristic sign of infection control.

Case 11. M. R.—With no history of rheumatic fever, this man of 28 had been regarded since childhood as a cardiac. His activities had always been limited, and because of episodes of palpitation he had been on maintenance doses of digitalis for the last two years. The

present illness began two weeks before admission to The Mount Sinai Hospital with an infection around the medial side of the right great toe. After three days of listlessness he suddenly developed chills and a fever of 106.8°F. Without determining the bacterial cause of the illness, he was given penicillin for three days with no apparent effect. He was, therefore, admitted to a hospital where three blood cultures were reported as negative, as were also agglutination tests for salmonella and brucella infection. He was given aureomycin, 4 Gm. daily, with no response, and then therapy was changed to procaine penicillin, 5,000,000 units, combined with streptomycin, 2 Gm., and chloramphenicol, 4 Gm., a day for five more days. In spite of this, the spiking temperature continued. Petechiae appeared and a sharp pain developed in the left upper quadrant of the abdomen.

He was then transferred to The Mount Sinai Hospital on the service of Dr. Charles Friedberg, where it was found that he had an auricular fibrillation with a harsh, loud, apical systolic murmur and a soft diastolic rumble. The liver and spleen were enlarged. There was still redness and swelling around the right great toe. The temperature reached 106.8°F. on the day of admission. A blood culture was taken, which yielded a hemolytic *Staphylococcus aureus*. On the day after admission, he was given 4,000,000 units of penicillin and on the following day this was increased to 3,000,000 units every three hours, together with 1 Gm. of aureomycin every four hours. There seemed to be some slight improvement at first, but then he grew rapidly worse, and on the fourth day the temperature reached 104°F. and the blood culture was still positive. Tests for sensitivity of the organism then revealed the fact that it was fifteen times as resistant as the test organism to penicillin, twice as resistant to aureomycin, three times as resistant to chloramphenicol and terramycin, and only half as resistant to bacitracin. Furthermore, $\frac{1}{2}$ of the inhibiting dose of bacitracin plus $\frac{1}{50}$ of the inhibiting dose of penicillin inhibited the growth of the organism *in vitro*. Accordingly, on the sixth day of hospitalization, bacitracin was given intramuscularly every four hours in addition to the penicillin and aureomycin. This produced in the serum an antibacterial activity, equivalent to 40 units of penicillin or 17 units of bacitracin per cc. Thereafter the temperature subsided rapidly and clinical improvement began almost at once. All subsequent blood cultures were negative, and the embolic phenomena disappeared. Bacitracin was continued for fourteen days without any evidence of renal toxicity, in spite of the fact that on admission the urine showed a trace of albumin, white cells, red cells and many granular casts. The patient has remained well for almost a year.

Comment. This case illustrates the importance of obtaining early cultures of the causative organism and early tests for its sensitivity to the available antibiotics. This organism was much more sensitive to bacitracin than to the other antibiotics and its use was clearly indicated. Furthermore, it greatly potentiated penicillin. What it would have done alone, is not known.

CONCLUSION

One may ask what shall a doctor do, if he does not have available the services of a bacteriology laboratory. The answer is, that every surgeon must have access to a hospital and every hospital should have a laboratory with these facilities. If it does not, it will have to admit, that it cannot give the patient adequate service. It has long and frequently been pointed out by the senior author, that every hospital would better serve the community and also save money now wasted on useless hospitalization if, by adequate laboratory facilities, it could point the way to earlier diagnosis and more intelligent treatment of surgical infections.

Our contention is that no hospital should have the approval of the American Medical Association or the American College of Surgeons, unless it can give

these services. If the trustees of any hospital cannot see the actual financial saving of such a provision, the withholding of approval could bring the matter vividly to their attention. If hospital laboratories cannot, or will not, fulfill their responsibilities, the public health laboratories should perform these functions.

It has been suggested that a special laboratory be set up in some university center to provide these facilities for a large number of hospitals which are not in a financial position to furnish their own laboratory services. Such a laboratory might be supported by yearly contributions from hospitals receiving the service, as well as by foundations interested in more efficient medical practice. Commercial firms, manufacturing antibiotics, might see that it would be to their advantage to contribute to the support of such a central laboratory, and if proper data were collected on the results, obtained from various kinds of treatment, the indications for and limitations of each antibiotic would be more clearly understood. If such a plan should prove effective in certain localities, by proper organization and administration it could be expanded to serve larger and larger areas. The World Health Organization of the United Nations might eventually undertake to sponsor, and perhaps utilize, such a plan to gradually bring all infectious diseases under complete control.

While such a centralization of effort might work, it would have certain faults, the chief one being the loss of close contact between the laboratory and the doctor caring for the patient. For the present, at least, we advocate that each hospital provide its own laboratory as outlined above. In the last analysis, it is the chief surgeon who must demand this service for the benefit of the patients under his care.

SURGICAL GRAND ROUNDS*
WITH
DEMONSTRATION OF SELECTED CASES

Conducted by
RALPH COLP, M.D.
With the Assistance of
ALEXANDER RICHMAN, M.D.

CASE 1—CARCINOMA OF THE CECUM

Dr. Benjamin Feldman: This is a white woman, aged 75 years. One year prior to her admission to this hospital she began to complain of intermittent pain in the right lower quadrant. A barium enema and an upper gastrointestinal X-ray series were carried out. These were reported as showing no abnormality. Six months later she appeared to have lost some weight. In another four months, X-ray studies were repeated and a suggestive duodenal ulcer was reported. The patient received conservative therapy without relief of pain. Shortly before admission, a barium enema disclosed a lesion in the cecum and on admission to the hospital a palpable mass, approximately the size of an orange, was discovered in the right lower quadrant; it was freely movable. Her liver was not palpable; a rectal examination was negative. The most pertinent laboratory finding was that of a hemoglobin value of 7 Gm.

Dr. Sigmund Brahms: In all of the films which were made prior to the hospital admission (fig. 1), the cecum and proximal ascending colon were incompletely filled because of the presence of a mass. In this region, the mucosa is completely destroyed and an irregular patch of barium is seen, which probably is the site of a necrotic ulcer. This has the appearance of an ulcerated carcinoma of the cecum and ascending colon.

Dr. Colp: This patient was seen by a prominent gastro-enterologist in this city who felt that, because of the presence of a mass and an enlarged liver in a patient of 75, nothing should be done. My own feeling was that, although this woman unquestionably did have a carcinoma, she should be explored because one could never be sure as to the operability. At the time of her exploration, a carcinoma of the cecum was found; it was freely movable. There were no metastases to the liver and the pelvis was free. Accordingly, a right sided ileo-colic resection was performed with a side-to-side anastomosis. The pathologic report was carcinoma of the cecum without involvement of the lymph nodes. The patient has had a rather stormy course complicated by an ileus which lasted for about 7 days; it has now subsided. While she is still in a weakened condition, it is felt that there is promise for an uneventful recovery.

Dr. Asher Winkelstein: Some cases of carcinoma of the cecum, which we have seen here recently, have raised the question of dilatation of the small bowel. It

* At The Mount Sinai Hospital, New York, March 21, 1951.

may be recalled that recently we had two cases with small bowel obstruction. In this case, the radiograms show no evidence of small bowel dilatation. I believe that it is not the size of the tumor in the cecum that is usually responsible for the obstructive appearance and dilatation, but rather the involvement of the ileo-cecal valve. The specimen in the case, however, clearly demonstrated that the



FIG. 1. (case 1) Barium enema, indicating distorted mucosal pattern and irregularity of the cecum.

ileo-cecal valve was narrowed by the tumor growth. Here is a large mass and yet there is no evidence of obstruction.

CASE 2—CARCINOMA OF THE PANCREAS

Dr. George Robinson: A woman, aged 61 years, was admitted with a six months' history of anorexia and vomiting. Prior to that time she was apparently well. Four months after the onset of the anorexia and vomiting, she developed

fullness, belching, heartburn, and lost a considerable amount of weight. There was no history or evidence of gastro-intestinal bleeding, and there was a total absence of pain. When examined, she was found to be of slight build and moderately dehydrated. The only significant finding was a visible gastric peristaltic wave and a succussion splash. The laboratory studies revealed a hypochloremic alkalosis with a CO_2 combining power of 79 volumes per cent and a blood chloride value of 92 m eq/l. The Rehfuess test showed a free acidity of 60 and a total of 90. The gastric residual was 1100 c.c.

On the second hospital day, during the course of a gastric lavage, the patient aspirated some material, and this led to the development of bronchopneumonia. The latter lasted about 10 days, during which time the abdominal signs and symptoms subsided and it was deemed advisable for her to return to her home for a convalescent period and then to readmit her for surgical intervention. At home symptoms returned and the vomiting persisted. Two days later she re-entered the hospital and shortly thereafter was operated upon.

Dr. Alexander Richman: X-ray studies were made elsewhere. At the time of the examination she was found to have a markedly distended stomach precluding a satisfactory examination, even following gastric lavage. There was still evidence of a large amount of retained mucus and secretion and it was impossible to fill the pre-pyloric region or the duodenal bulb. There was no evidence of an extrinsic mass. The duodenal curve could not be outlined. She was therefore diagnosed as a case of pyloric obstruction without an obvious underlying cause. In view of her age the most likely condition would seem to be a carcinoma and, accordingly, she was referred for surgical intervention.

Dr. Percy Klingenstein: At operation a mass was found involving the first portion of the duodenum and the pylorus which had caused the pyloric obstruction. This mass was bulky and, on mobilizing the duodenum, we felt that it might be an intrinsic lesion of the stomach. However, it was found that the mass had penetrated posteriorly and inferiorly and involved the pancreas. It was considered to be a tumor of the head of the pancreas presenting for the most part inferiorly. Gastro-enterostomy was performed because the prime consideration here was to relieve the pyloric obstruction. During this procedure a finger was introduced into the stomach and it was determined that this was an extramucosal lesion because the mucosa over the mass was completely smooth. A biopsy was taken. Now, whereas the biopsy may not disclose conclusively whether this was a primary tumor of the pancreas or that of the stomach because it presented on the serosa, all evidence points to an extragastric obstructive lesion.

Dr. Colp: This is the third case we have encountered within recent months, in which a diagnosis of pyloric obstruction was made, presumably due to an ulcer, and disclosed at the time of operation a carcinoma of the pancreas. It is rather significant that carcinoma of the pancreas involving the head and infiltrating the duodenum may exist without producing pressure on the common bile duct, resulting in jaundice.

Dr. Burrill Crohn: I saw a case in which narrowing and distortion of the second portion of the duodenum led to the diagnosis of carcinoma of the head of the pancreas. It was the only factor which was indicative of this diagnosis.

Dr. Winkelstein: I think that one of the significant features in this case and one that Dr. Colp emphasized is that it is possible to have obstruction of the duodenum in its 1st, 2nd, or 3rd portions, not far from the entrance of the common duct into the duodenum, caused by a carcinoma of the head of the pancreas, without jaundice. This is not generally recognized. I think that the evidence is now clear that it is not unusual to have an absence of jaundice in the presence of a carcinoma of the head of the pancreas. Careful radiographic study of the entire duodenum is an essential step in the diagnosis. This may sometimes be done better by putting a tube into the duodenum and filling the duodenum directly rather than by giving barium orally.

Dr. Marshak: Drs. Dreiling, Friedman and I recently recorded in "Gastroenterology" four cases of similar nature from Dr. Colp's Service. These were instances of pyloric obstruction of the stomach due to a carcinoma of the pancreas, very similar to this one, without jaundice.

Dr. Crohn: The last number of "Gastroenterology" contains a review of 68 cases of carcinoma of the pancreas, which emphasizes this same point.

CASES 3 AND 4—GASTRO-INTESTINAL BLEEDING, FOLLOWING SUBTOTAL
GASTRECTOMY FOR DUODENAL ULCER

Dr. Ira Levy: The first case is that of a man, aged 41 years, who was well until 1943, when he became subject to pre-prandial epigastric distress and pain which was relieved by food, milk or alkali. X-ray examination at that time disclosed a duodenal ulcer. He was placed on medical therapy with good response. In 1948 he entered the hospital with signs and symptoms of pyloric obstruction for which a subtotal gastrectomy was performed without a vagotomy. Post-operatively he was achlorhydric as shown by a Rehfuess test, and in 1949, a re-examination showed no free acid. In June and November of 1950 he had two minor episodes of melena. He was well until two weeks prior to his recent admission when he had a period of epigastric distress of short duration followed by a tarry stool three days prior to admission. A general physical examination was essentially negative. Laboratory studies revealed hemoglobin, 9 Gm., a Rehfuess test indicating 35 units of free HCl, and a tarry stool. He was transfused repeatedly but his hemoglobin could not be raised above 10 Gm.

Dr. Brahms: The films showed the status which followed the subtotal gastrectomy. The region of the stoma was well demonstrated and there was no evidence of ulceration at or about the stoma. There was no delay to the passage of barium through the stoma and the conclusion was that there was no roentgen evidence of marginal or jejunal ulcer.

Dr. Vernon Weinstein: At operation the stomach was found to be small, as the result of a high resection, and which otherwise appeared normal. The gastro-jejunal stoma and the area of the anastomosis showed no evidence of acute ulcer. Both jejunal limbs also were negative. It was felt that, if a gastro-jejunal ulcer was present, it had probably healed, or that because of its size it couldn't be felt through the wall of the stomach or jejunum, or that the bleeding arose from a superficial erosion. It didn't seem wise to open the stomach or jejunum to look for the ulcer or erosion, and further exploration of the duodenal area

showed no evidence of an acute inflammatory process. The entire small bowel was negative and it was deemed advisable to perform a bilateral infra-diaphragmatic vagotomy.

Dr. Levy: The second case is that of a man aged 57 years, who had had an ulcer history for the past 15 years. This was originally confirmed by X-ray studies. Thirteen years ago, because of intolerable pain, a subtotal gastrectomy for a penetrating duodenal ulcer was performed here. Since that time he has been entirely asymptomatic except for one episode of melena two years ago. About a week prior to admission he again had an episode of melena which persisted until his admission. At this time examination disclosed as the only important finding a marked anemia; the hemoglobin was 6 Gm. The patient was treated on the Medical Service conservatively with bed rest and multiple transfusions. With the cessation of bleeding he was transferred to the Surgical Service. A Rehfuess test at that time showed about 30 units of free HCl.

Dr. Brahms: Again, we have the films of the patient who has had a subtotal gastrectomy. The barium passed through the stoma without delay. The mucosa of the stomach and of the stoma appeared normal, but on several of the films opposite the stoma in the jejunum there was a large pocket which suggested the possibility of a jejunal ulcer.

Dr. Colp: This man was explored by me and I found no evidence of a gastro-jejunal ulcer. An opening was inadvertently made into the stomach, which was then purposely incised so that a finger could be introduced into the stoma itself. This substantiated the original observation that no gastro-jejunal ulcer was present. Inasmuch as this man was rather obese and it was impossible to expose the infra-diaphragmatic portion of the esophagus, a trans-thoracic supra-diaphragmatic bilateral vagotomy was performed. As we look back upon this case, we should have suspected that this man did not have a large jejunal ulcer, because at no time did he have any pain. It is most unusual for a jejunal ulcer of this magnitude not to cause great distress. I think it is also noteworthy that this patient had his subtotal gastrectomy performed about 12 years earlier and remained well for 10 years. This demonstrates again the necessity of an accurate and prolonged personal followup in all these cases. Both the first and the second case demonstrate this problem of bleeding without pain which may arise from either an erosive jejunitis or a gastritis without actual gastro-jejunal ulceration being demonstrated. We now have sufficient evidence that the addition of a vagotomy in these cases in which a subtotal gastrectomy has been performed previously will not necessarily protect these patients from the ravages of subsequent bleeding. Dr. Weinstein, what is our incidence of recurrence with vagotomy added to subtotal gastrectomy as a secondary procedure?

Dr. Weinstein: Do you have in mind those in which gastro-jejunal ulcer has developed after a subtotal gastrectomy or a gastroenterostomy?

Dr. Colp: In both groups.

Dr. Weinstein: The recurrence rates vary up to 30–40 per cent, depending on the nature of the primary operation. After gastroenterostomy it was 40 per cent; after subtotal gastrectomy it was 30 per cent. These figures refer to those

cases in which vagotomy alone was done as a secondary operation. In other words a vagotomy was done once gastro-jejunal ulcer developed. However, when a complementary vagotomy and the subtotal gastrectomy were performed as original procedure for duodenal ulcer, there has been no recurrence of bleeding, to date.

Dr. Winkelstein: I have observed that if a patient has had hemorrhages before subtotal gastrectomy and then has them after the subtotal gastrectomy, irrespective of whether there is pain or not, there is usually a recurrent jejunal ulcer. However, if the patient has not had hemorrhages before the subtotal gastrectomy, and later has hemorrhage without symptoms, a certain number (the exact percentage would have to be determined by careful study) do not have a recurrent ulcer but apparently bleed from superficial erosions, either of the stomach or the jejunum. Another point of importance is the failure of vagotomy in a certain number of the cases to heal a recurrent jejunal ulcer after gastro-enterostomy or subtotal gastrectomy, while vagotomy combined with simultaneous resection of the stomach as a prophylactic measure for jejunal ulcer is highly successful. I think we ought to try to discover what is the difference in these two situations to help solve one of the central problems in the surgery of duodenal ulcer.

Dr. Crohn: Just a word on the prognosis of hemorrhage in so-called gastro-jejunal ulcer. While hemorrhage in gastro-jejunal ulcer is fairly common, the mortality is low. These cases, while they bleed, rarely bleed fatally. Now, I'd like to ask Dr. Brahms about the explanation of this so-called gastro-jejunal ulcer detected in X-ray studies but which was not verified by operation. Apparently folds at a previous operation could so simulate a jejunal ulcer as to mislead the roentgenologist. That point was brought up recently in an article on the interpretation of gastric folds published in the *Journal of the American Medical Association*. These folds seal directly end on end and can give all the appearances of a penetrating ulcer.

Dr. Brahms: I think that what Dr. Crohn has said is true. We have encountered great difficulty with the pocket-like configuration produced by folds on the gastric side of the anastomosis and less commonly on the jejunal side. Ordinarily, I think we can demonstrate a fairly good jejunal mucosal pattern. This case, however, was difficult because of the obesity of the patient and the location of the anastomosis with reference to the costal cage, so that good compression could not be made.

Dr. Weinstein: I would like to take up the question again as to what it is that produces bleeding in a case like this. I feel very strongly that the same cause produces duodenal ulcer in the first place, as well as stomal ulcer, the superficial erosions, and the associated gastritis or the jejunitis, and that these cases should be classified as having a common etiology, our knowledge of which is at present incomplete. We are in error when we speak of erosions or gastritis or jejunitis of this type as a disease different from peptic ulceration.

Dr. A. Cornell: We studied a case of bleeding ulcer recently which was operated upon and which fits into this picture. This man had a sudden onset of hemor-

rhage with tarry stools, without pain. A very high subtotal was done on him as was shown by X-ray studies following a hemorrhage after the operation. He was gastroscoped recently and no ulcer was seen, but an erosive gastritis was present. I wonder whether or not these two cases showed gastritis.

Dr. Colp: These cases did not have gastroscopies.

CASE 5—GASTRIC ULCER

Dr. Ralph Colp, Jr.: This is a white man, aged 63 years, who entered the hospital one month ago complaining of epigastric pain. His history goes back



FIG. 2. (case 5) Projection on lesser curvature of stomach with infiltration at the base.

15 years at which time he noted the onset of burning epigastric pain, relieved by food and alkali. X-ray studies revealed a duodenal ulcer. He was placed on an ulcer regime and did well for about 13 years except for occasional episodes of pain. About a year ago epigastric pain recurred; it increased in severity and has continued to the present time. Physical and laboratory examinations were essentially negative. Gruel Rehfuß revealed free acid of 28 degrees and total acid of 50 degrees.

Dr. Brahms: On the lesser curvature aspect of the stomach, (fig. 2) distal to the re-entrant angle, there is an obvious projection, which undoubtedly represents a crater, and there is an area of diminished radiographic density which

corresponds to infiltration. When such an appearance is noted in the stomach it is very difficult, and often impossible, to determine if the infiltration represents inflammatory reaction about a benign ulcer or invasion by carcinoma. In some of the films, gastric mucosa was seen to radiate to the base of the ulcer and it was felt that the appearance favored the diagnosis of a benign ulcer, but we must admit the possibility of the presence of a carcinoma.

Dr. Colp: At the time of operation palpatory findings convinced me that we were dealing with a carcinoma of the stomach. Accordingly, a subtotal gastrectomy was done and when the specimen was submitted to the pathologist, he refused to make a diagnosis on the gross inspection, and even after histologic preparations were reviewed, he felt that additional sections should be prepared. Finally, he came to the conclusion that this was a benign lesion. This case is shown to demonstrate the difficulty of making a definite diagnosis of pre-pyloric lesion, a difficulty experienced also by the roentgenologist and pathologist. It also shows the futility of treating a patient medically for 15 years when surgery might have been employed and this man might have enjoyed good health.

Dr. Richman: Although the history was that of recurrent benign gastric ulcer, the X-rays were strongly suggestive of neoplasm and it was felt that we were dealing with a patient who had developed gastric carcinoma as an independent lesion. It was also possible that this might be one of those rare cases of ulcer becoming malignant. Accordingly, operation was urged and finally consented to. I think that when one considers that the percentage of error is about 14 per cent, that is, that one out of every seven gastric ulcers assumed to be benign is actually malignant, operation is mandatory in cases of this type.

CASE 6—LYMPHOSARCOMA OF THE STOMACH

Dr. Irving Parnes: This patient, a man, aged 39 years, entered the hospital complaining of tarry stools, general weakness, shortness of breath and dizziness of 4 days' duration. For the previous two months he had had epigastric pain and discomfort (occurring mostly at night) and relieved by milk and diet. In 1946 he had suffered for two months from similar pain and discomfort. At that time a gastric series was said to have been negative and he had had no tarry stools. On admission to the hospital, the hemoglobin was 8 Gm. He was given several transfusions and placed on a Muelengracht diet. Upon cessation of bleeding, a gastro-intestinal series was done.

Dr. Brahms: I would like to discuss this case primarily in terms of what the films show (fig. 3). A benign gastric ulcer was postulated because a patch was demonstrated on the lesser curvature aspect of the stomach and apparently perfectly normal mucosal folds radiated towards the patch. It is, however, striking that the patch is so distant from the general contour of the stomach and that the mucosal folds actually enter into a niche-like structure, the crater, toward the patch. Ordinarily in a penetrating ulcer, we do not think of mucosal folds entering well into the penetration; the entire penetration is made up of ulcer. The appearance in this case, however, suggested to at least one member

of the Department that a mass outside the stomach was partially ulcerated and that growth of the mass had separated the site of ulceration from the wall of the stomach. Because of adherence to the mass at the site of erosion, mucosal folds adjacent to the ulcer followed the ulcer as the interposed mass grew. I believe the films substantiate this interpretation. There is no evidence of infiltration of the mucosal folds at the very edge of the ulcer. The mucosal folds are normal in appearance.

Dr. Colp: Influenced by the fact that this man was 39 years of age, that an abundance of free hydrochloric acid was present in the test meal, and that the



FIG. 3. (*case 6*) Ulcer crater on lesser curvature aspect of the stomach with evidence of an extrinsic mass.

X-ray report of this lesion was that it was benign, we accepted this opinion. The Resident carried out the operation under the supervision of Dr. Klingenstein.

Dr. Klingenstein: This man was explored by the Resident Surgeon who immediately appreciated the fact that a huge fist-sized mass on the lesser curvature of the stomach was penetrating into and involving the left lobe of the liver. The rest of the liver appeared to be normal. In the absence of any demonstrable gross lymph node involvement, it was felt that this entire tumor mass could be extirpated if one did a formal excision of the left lobe of the liver. This was

undertaken anatomically without any great difficulty and the tumor was then resected along with the entire stomach and spleen, as is the usual practice in extirpating high lesser curvature malignancy close to the cardia. The left lobe of the liver came away without a great deal of difficulty, as the anatomical landmarks were exposed with the bare area of the liver posteriorly. We were very careful not to get into any trouble with the hepatic vein. Visualizing the vessels and the large biliary ducts which were individually ligated, the liver was cut across; the procedure itself was not difficult or bloody. It was felt that this was an epithelial neoplasm of the stomach which involved the liver in continuity. Of course, if this were a true metastasis in the accepted sense of the word, I think the judgment exercised here would have been extremely poor, but inasmuch as it was felt that this was a direct extension of a neoplasm of the stomach and that it presented no more evidence of malignant invasion than perhaps an adherent gastric neoplasm to the pancreas, which is also frequently resected, it was felt that this was indicated here. The report of the pathologist showed the gastric lesion to be a lymphosarcoma with direct extension into the liver.

Dr. Colp: This case is a tribute not only to brilliant surgery but to excellent surgical judgment in performing an excision of the left lobe of the liver together with a total gastrectomy in a man of 39 years of age with a direct extension of the tumor to the liver rather than a metastasis. This man who walked in here today is now 9 days after operation and on the day following operation, he had as much reaction as though he had had an interval appendectomy. The interesting thing to me, too, is the fact that he never drained any appreciable amount of bile which brings up the question as to whether there is a connection between the right and left hepatic lobes. An operation has been advocated by Dr. Longmire of John Hopkins' for extensive stricture of the hepatic duct. He advocated resection of the left lobe of the liver in an effort to find a large enough intra-hepatic biliary radical to which the jejunum could be anastomosed. Theoretical objection to this procedure has been raised on the ground that there is very little if any direct anatomic connection as far as bile secretion is concerned between the right and left liver lobes.

CASE 7—MILROY'S DISEASE

Dr. L. Hollander: This man, aged 39 years, entered the hospital for the fourth time in January of this year with a history of progressive swelling of his legs and lower trunk since the age of nine years. He has a very strong family history of this disease. His father and one brother also have similar complaints. He has had repeated attacks of erysipeloid infection and lymphangitis of his lower extremities, each one of which was followed by increased swelling of his lower legs and he enters now with swelling up to his mid-abdomen. He had had an operation of his left leg, a Kondoleon procedure in 1943, with only slight relief of symptoms in the operated leg. At the time of admission, physical examination disclosed as a significant feature, massive edema of his legs, extending up to and including his scrotum and lower abdomen, huge ulcerations

of the skin of the lower legs, and the scar of the previous procedure on the medial aspect of the left leg. His weight was over 300 pounds (the scale available on the ward only registered up to 300 pounds). On prolonged bed rest, elevation, and mercurial diuretics (he had a massive diuresis), he lost at least 80 pounds in weight. At the end of this time he developed an erysipeloid infection of the skin of the right side of his abdomen which subsided promptly on penicillin. After the skin ulcerations on the lower legs had healed, he was deemed ready for surgery which Dr. Simon will describe.

Dr. Bernard Simon: There are several points of great significance in this case, one, of course, being the family history. There is the question of whether this is a true Milroy's disease in the sense of its being congenital. There is, however, no doubt that there is a *familial* element, and, as you have heard, several members of his family have this same disease. Now, the other point of interest is the therapy. There are so few cases like this that progress in the treatment of the disease has been extremely slow through the years. The old Kondoleon-Sistruck procedure which was performed on his left leg was based upon the theory that if one could establish a communication between the superficial and the deep lymphatics, one might be able to relieve the condition. Only recently, and since the time the operation was performed on the patient in 1943, has it become known that whatever benefit does accrue from the Kondoleon-Sistruck operation is derived from the *actual excision* of diseased lymphatic bearing tissue. The procedure performed sixteen days ago on this patient consisted of resection of the skin, subcutaneous tissue and the investing fascia of the muscles of the lower leg, and the resurfacing of the denuded area with intermediate thickness skin grafts, derived partly from the resected skin and partly from the skin of both thighs. It was quite evident from gross inspection of the tissue at the operating table that this was badly diseased tissue and extensively scarred as a result of recurrent bouts of erysipeloid inflammation and of no use to the patient. By analogy, one might liken it to the situation in chronic ulcerative colitis in which, despite the fact that the process may have become quiescent, the bowel itself is so fibrotic, and riddled with disease that the pathological changes have become irreversible, and its continued presence can only lead to trouble for the patient. Examination later by the pathology department bore this out. On microscopic examination the resected tissue was found to be the site of extensive scarring and chronic inflammation. Of interest, also, is the fact that the disease is restricted only to the superficial tissues and fascia. You will notice that he now has a perfectly slim ankle and that the contour of the operated leg is essentially normal. Also of interest was the use in this case of the Brown Electric Dermatome, an instrument which must be regarded as of gadget value, perhaps, but important in the occasional case in which a large amount of skin must be removed rapidly. I should like to give you an idea of the extent of the skin graft required in this case. Following operation we made a pattern of the excised tissue by placing the specimen on a sheet of newspaper and tracing it around. The pattern was laid out on graph-paper and by counting the number of squares it was possible to arrive at the fact that the surface of the denuded leg was 1,556 square centimeters or 241 square

inches. In terms of the Padgett Dermatome (the average drum of skin amounting to about 25 square inches), this amounted to a graft of 10 drums of skin. The procedure was quite prolonged and he required the replacement of eight pints of blood to carry him through it. I should like to conclude by emphasizing the gravitational factor in these cases. His leg decreased by half and his weight by 85-90 pounds upon prolonged elevation in the Deckert Bed during the preoperative period of about four weeks. It would be fair to state that had operation been performed at the time of entry, the resected tissue which is being displayed here would have been three to four times the present thickness and weight due to the tremendous amount of edema fluid contained in the tissue spaces and dilated lymphatics.

Dr. Colp: I think that the result speaks for itself and that Dr. Simon is to be congratulated for the particular care he took in the preoperative preparation of this patient and for his operative skill. The excellence of the skin graft is demonstrated by the fact that over 75 per cent of the graft has taken.

Summary

We have presented to you this morning seven surgical problems illustrating the need for intensive study and discussion before operation is undertaken. These cases have required clinical, laboratory, and radiographic examinations in order to arrive at a working diagnosis which would warrant operation. In two of these cases (gastric ulcer and lymphosarcoma of the stomach) the diagnosis was clarified by the pathologist who examined the surgical specimens. In addition, one case, which showed the typical picture of pyloric obstruction secondary to ulcer or carcinoma, was found to be carcinoma of the pancreas with extension into the duodenum and stomach.

In recapitulation, the aforementioned three cases illustrate the great difficulty in making a definite decision as to whether or not a gastric ulcer, or what seems to be a complication of an ulcer, is benign or malignant. I have made this point many times in these conferences and I shall continue to emphasize it. The physician who undertakes to treat a recurrent gastric ulcer by a medical regime assumed a grave responsibility. If the radiologists cannot make a differential diagnosis with certainty, and at exploration the surgeon has a similar difficulty, and the pathologist must often await a histologic examination, how can the medical man continue to treat these patients conservatively? In many instances, the patient with gastric cancer is denied a chance of a cure, and the patient with a benign ulcer is left with needless suffering. I have always felt that gastric ulcer should be treated surgically and I shall continue to adhere to that policy.

In the foregoing discussions we have not presented to you our routine of pre- and postoperative care. However, we wish to stress the need for the most careful attention to electrolyte and nutritional status and to the cardiac, pulmonary and renal conditions of the patient.

I want to express my thanks to the members of the Medical Attending Staff and the Resident Staff whose contribution to total care of the patient is most essential.

VIRAL HEMAGGLUTINATION

A REVIEW AND SOME OBSERVATIONS*

ALFRED L. FLORMAN, M.D.†

It was in 1941 that Hirst first (1) and then McClelland and Hare (2) independently discovered the phenomenon of viral hemagglutination. In his book "The Way of an Investigator", Walter B. Cannon (3) speaks of "Gains from Serendipity" to describe the happy use of good fortune in science. Viral hemagglutination might well have been included in that chapter, for just as in the fairy tale, the Three Princes of Serendip were "always making discoveries by accident or by sagacity, of things which they were not in quest of"—it was while he was opening an embryonated egg infected with influenza virus that Hirst first observed that the red blood cells which had escaped from a torn blood vessel were agglutinated. He investigated this further and found that this agglutination was specific: if it was caused by an influenza Type A virus, it was inhibited only by sera containing antibodies for influenza A; if it had been caused by a Type B virus, it was inhibited only by sera with antibodies for influenza Type B (chart I).

This discovery initiated the great search for other viruses which might also possess this property. All known viruses were tested against a great variety of erythrocytes, including even those from copperhead snakes. The conditions of the test were varied as to temperature, pH, ionic concentration, etc. All these factors were found to influence the results. Nevertheless, with most viruses the test has remained negative. Table I includes most of the viruses now known to agglutinate one or more species of erythrocytes (4-6). A number of other viruses including Japanese B, St. Louis encephalitis, and some poliomyelitis strains have recently been shown to be hemagglutinators under very special conditions (7). It will be seen that relatively few in the table (table I) are primarily human pathogens. With some, such as the influenza, mumps, and Newcastle disease virus (NDV), it is the virus itself which is the agglutinating agent. With others, such as ectromelia and vaccinia, it is a soluble product of the virus which is responsible for the reaction. The agglutinating viruses may also be differentiated on the basis of whether or not they spontaneously clute from the agglutinated red blood cells.

Certain bacteria, pleuropneumonia organisms, and the rickettsia of scrub typhus are also hemagglutinators. In addition, certain tissues which are commonly employed as source of virus may contain small quantities of an agglutinating factor for one or more species of erythrocytes. This is true for the mouse brain (5), the amniotic fluid from chick embryos, especially after the 15th day

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(8), and, as was pointed out by me several years ago (9), the allantoic fluid from some embryonated eggs which have been inoculated with unfiltered, but penicillin treated, throat washings. In the latter instance, the hemagglutination may be present even after relatively high dilution. However, unlike the specific viral

BASIS OF AGGLUTINATION-INHIBITION TEST






SERUM	INFLUENZA A VIRUS	CHICKEN CELLS	AGGLUTINATION
—	—	✓	○ 
—	✓	✓	⊕ 
NORMAL	✓	✓	⊕ 
CONVALESCENT INFLUENZA A	✓	✓	○ 
CONVALESCENT INFLUENZA B	✓	✓	⊕ 

CHART I

TABLE I

Some hemagglutinating viruses

VIRUSES	ERYTHROCYTES				SPONTANEOUS ELUTION
	Man	Chicken	Sheep	Guinea pig	
Influenza A & B	+	+	±	+	Yes
Mumps	±	+	—	+	Yes
Newcastle disease (NDV)	+	+	±	+	Yes
GD-VII	+	—	—	—	Yes
Columbia SK Group	—	—	+	—	Yes
Pneumonia Virus of Mice (PVM)	—	—	—	—	No
	(agglutinates mouse and hamster cells)				
Ectromelia	—	+	—	—	No
Vaccinia	±	+	—	+	No

+ = All strains agglutinate cells.

± = Some strains agglutinate.

— = No strains yet found to agglutinate.

hemagglutination, it is inhibited by very small amounts of normal rabbit or human sera.

Interest in viral hemagglutination has been mainly along two lines: the usefulness of the phenomenon as an aid in clinical diagnosis, and the nature of the reaction. The present discussion will be limited to the latter with special emphasis on the viruses of influenza, mumps, and Newcastle disease. These viruses react with susceptible erythrocytes, and so offer an inviting possibility of a

simple *in vitro* model for studying the pathogenesis of infection. This reaction is presumed to take place in the following order: a) red blood cells adsorb the virus particles, b) red blood cells agglutinate, c) virus elutes (is released) from red blood cells, and d) red blood cells remain permanently modified. The eluted virus is indistinguishable from the original. It was first suggested by Hirst (10) that this resembled an enzymatic reaction in which the virus contains the enzyme and the erythrocytes the substrate.

Our studies have been mainly concerned with the end product of this reaction, the modified cell, and with substances which influence the adsorption of virus and the agglutination of red blood cells.

Burnet (11) in 1945 reported that a number of hemagglutinating viruses could be arranged in a linear series such that cells treated with a given virus were no longer agglutinated by virus strains earlier in the series, but were still agglutinated by those succeeding it. The series was mumps, Newcastle disease, most influenza A strains, influenza B, and swine influenza. This resistance of treated erythrocytes to agglutination has been likened to the resistance to infection observed when the presence in an organism of one virus prevents or inhibits the multiplication of another. This *in vivo* phenomenon has been called interference. It has been found in certain instances to be associated with antigenically widely different viruses. It is obviously desirable to have an *in vitro* model for studying this and other aspects of viral infections. To test the validity of the treated red blood cell as such a model, a quantitative reinvestigation was first undertaken into the alterations that take place in chicken erythrocytes following contact with hemagglutinating viruses (12).

In general, we confirmed the gradient described by Burnet but found that the exact order in it of certain viruses might reflect the manner of treating the cells. However, in all of our experiments red blood cells treated with the PR-8 strain of influenza were subsequently unable to adsorb or to be agglutinated by the Newcastle disease virus (NDV), while cells treated with NDV were still able to adsorb and to be agglutinated by PR-8 almost as well as the controls. If hemagglutination were a completely satisfactory model of virus infection, changes similar to these might be expected to occur in chick embryos following infection with the same viruses, i.e., chick embryos infected by PR-8 should be resistant to infection by NDV, while those infected with NDV should still be susceptible to PR-8. This hypothesis was tested in a number of experiments. It was found that the susceptibility of an embryo was so altered by which ever virus first infected it, that secondary inoculation of even very large amounts of heterologous virus failed to induce infection. This is unlike what occurs with virus modified red blood cells. We were therefore forced to conclude that the idea that the attachment of virus to red blood cells might be a model for the early stages of infection of living cells, can at best be only partially valid (12).

There has been considerable interest in those non-specific inhibitors of viral hemagglutination which are found in serum and in allantoic fluid, since there is evidence that they may be analogues of the cell receptor (13). Our interest in the inhibitor present in normal allantoic fluid (NAF) was aroused in the course of a

comparison of the agglutination of chicken and human erythrocytes by the Enders strain of mumps virus. The influence of this inhibitor was found to be strikingly more effective when human rather than chicken cells were used (table II). Evidence of the greater activity of this inhibitor in the presence of human cells was also obtained when viral adsorption was studied with these two species of cells (14).

TABLE II

Titration of allantoic fluid infected with mumps virus using chicken and human red blood cells

FLUID	CELLS	FINAL DILUTION OF FLUID								
		1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512
151-1	C	4	4	4	4	4	4	4	3	0
	H	3	4	4	4	4	2	0	0	0
2	C	4	4	4	4	4	4	4	4	0
	H	0	0	0	0	0	0	0	0	0
3	C	4	4	4	4	4	4	4	±	0
	H	0	0	±	1	1	0	0	0	0
4	C	4	4	4	4	4	4	3	2	0
	H	0	2	3	4	4	2	0	0	0

C = Chicken.

H = Human.

TABLE III

Inhibitory effect of NAF on agglutination by mumps virus of chicken and human cells

CELLS	NAF	FINAL DILUTION OF VIRUS								
		1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512	Saline
C	0	4	4	4	4	4	4	4	0	0
C	1:4	4	4	3	1	0	0	0	0	0
C	1:8	4	4	4	4	1	0	0	0	
C	1:16	4	4	4	4	4	2	0	0	
H	0	3	4	4	4	3	0	0	0	0
H	1:4	0	0	0	0	0	0	0	0	0
H	1:8	0	0	0	0	0	0	0	0	
H	1:16	0	0	0	0	0	0	0	0	

Italic figures = 2 and 4 units of virus present.

However, it was still not clear whether this apparently greater inhibiting effect of normal allantoic fluid on mumps virus agglutination of human red blood cells was not merely a reflection of the lesser sensitivity of human cells to the virus. The following experiment was therefore performed, and it made clear that the inhibitor is actually more active in the presence of human red blood cells. A single pool of mumps virus was diluted as indicated in Table III. Different amounts of normal allantoic fluid (NAF) were added to aliquots of each dilution. To one set of each pair there was added a suspension of chicken red blood cells,

and to the other set, a similar suspension of human erythrocytes. There was a linear reduction of titer when chicken cells were employed which was in striking contrast to the precipitous reduction observed when human cells were used. A comparison of the effect in the presence of 2 and 4 units of virus in each set is especially noteworthy (table III).

Somewhat similar observations were also made using small quantities of PR-8 and Lee viruses. However, with these viruses the effect of the inhibitor was more obvious with chicken than with human cells (14).

From earlier studies by others (13), it seems that the inhibitor in normal allantoic fluid (NAF) reacts with, and is inactivated by, hemagglutinating viruses. (A filtrate of *Clostridium welchii* and an enzyme from *Vibrio cholera* may similarly inactivate this inhibitor—just as they do cell receptors.) It has been postulated that a co-enzyme or co-factor exists for the hemagglutinating virus-inhibitor system. It had not been clear whether this hypothetical substance comes from the virus or the red blood cells (15). The results of the foregoing and similar experiments would seem to indicate that it is furnished by the blood cells. If one wishes to carry this over to the problem of pathogenesis of infection, this obviously suggests a host factor.

SUMMARY

The subject of viral hemagglutination is discussed. It is noted that the reaction between virus and susceptible red blood cells presents suggestive possibilities as an *in vitro* model for the study of certain aspects of viral infection and thus it should be of interest to all students of infectious disease. A few of these possibilities and their limitations are considered.

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THE PORTAL-SYSTEMIC VENOUS SHUNT IN THE TREATMENT OF PORTAL HYPERTENSION*

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Since Von Eck (1) performed the first portacaval anastomosis in dogs in 1877, the problems presented by portal hypertension have aroused great experimental and clinical interest. Prior to 1945, sporadic attempts had been made to anastomose branches of the portal system to those of the inferior vena cava, but thrombosis invariably developed. It was not until 1945 that reports of successful portal-systemic shunts appeared (2, 3). These successes stimulated a renewed interest in this field.

The phenomena usually associated with portal hypertension, esophageal varices and ascites, are caused by a block in the hepatic or extrahepatic portal system. When the obstruction is suprahepatic, an increase in portal pressure occurs, but it usually does not cause the development of esophageal varices and gastro-intestinal bleeding. When clinically significant esophageal varices are present, they are usually the consequence of hepatic or infrahepatic portal obstruction.

The intrahepatic form of portal obstruction is usually associated with cirrhosis of the liver. It is generally assumed that the irregular fibrosis which occurs compromises the lumina of the portal vein branches and thereby causes the elevation of portal pressure, but this has not been conclusively proven. On many occasions there have been marked discrepancies between the extent of liver fibrosis and the height of portal pressure. It has been suggested that the regenerating liver nodules, and not the scar tissue, play the dominant role in the obstruction of the portal vein (4).

In the extrahepatic form of portal obstruction, the patients are invariably in the younger age groups, and their liver function is usually normal. The so-called Banti's syndrome falls into this category. The obstruction usually involves the portal or splenic vein.

New operative procedures are constantly being proposed for the treatment of portal hypertension. This implies that a universally satisfactory method of treatment has not yet been evolved. The operations which have been suggested may be classified as follows (5).

1. Drainage procedures: a) insertion of glass button into abdominal wall; b) sapheno-peritoneal anastomosis; c) pyelo-peritoneal anastomosis.

2. Direct treatment: a) injection of esophageal varices; b) ligation of varices; c) esophago-gastric resection; d) mediastinal packing.

3. Portal-systemic venous anastomoses: a) omentopexy; b) portacaval and splenorenal anastomoses.

The results reported by the surgeons who have employed these procedures in the treatment of portal hypertension must be critically appraised. It is difficult

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to evaluate objectively any of these operations because it has been practically impossible to reproduce in animals a picture identical to the clinical syndrome. Accordingly, a procedure is evaluated merely in terms of the subsequent clinical course. It is certain that spontaneous cessation of bleeding from esophageal varices does occur. Although it is uncommon, some patients may not have a recurrence of bleeding for two to three years or longer, and then have a massive hematemesis. For this reason, long term follow-up observations are essential for the proper appraisal of any procedure.

Probably the crux of the problem is whether the operation performed effectively reduces the portal pressure. It is logical to assume that as long as there is a marked elevation of pressure, the possibility of bleeding from esophageal varices exists. One investigator has postulated that bleeding from the varices may be precipitated by peptic erosion of the esophageal mucosa (6), but this has not been conclusively proven.

The most promising procedure thus far in the treatment of portal hypertension has been the portal-systemic shunt. The rationale is logical; it is based upon the pressure differential between these two systems. In a patient with portal hypertension, the portal pressure may be as high as 500–600 mm. of saline, whereas the pressure within the inferior vena cava or renal veins is approximately 130 mm. Practically every branch of the portal tree has been joined to a radicle of the inferior vena cava in an attempt to decompress the portal system, but most of these anastomoses are unsatisfactory because of their small size. The spleno-renal and portacaval shunts are generally considered to be the only ones which allow for an effective reduction of portal pressure.

During the past few years, there has been some question as to whether the spleno-renal or portacaval shunt is preferable. The advantage of the former is that it can be carried out in almost all patients with portal hypertension because the splenic and renal veins are practically always suitable for an anastomosis. Another theoretical advantage is that the enlarged spleen is removed at the same time. However, after a portal vein-vena cava anastomosis, the spleen usually decreases markedly in size as a result of the lowered portal pressure. The disadvantages of the spleno-renal shunt are that marked atherosclerotic changes are frequently found in the splenic vein, especially in its distal portion, and that there is a greater chance of a twist occurring when this vessel is sutured to the renal vein (7). Furthermore, the splenic vein has many branches in the operative field, and the necessary dissection in and around the pancreas is often difficult and tedious.

The advantage of the portacaval shunt is that the portal vein is usually devoid of branches in the operative area. It is approximately twice the size of the splenic vein, and it is easier to manipulate because of its thick wall (7). A more effective decompression is achieved, and there is less likelihood of thrombosis at the site of anastomosis. It is true that such vital structures as the common duct and the hepatic artery are intimately related to the portal vein, but with the use of the thoraco-abdominal approach, these two structures fall away from the immediate operative area.

Although it is probably more desirable to create a portacaval shunt rather than a splenorenal anastomosis, in many instances this is impossible. In cases with extrahepatic obstruction, the portal vein is usually the site of extensive pathology and is therefore unsuitable for an anastomosis. Extensive postoperative adhesions in the right upper quadrant may make the dissection of the portal vein extremely difficult. As a rule, the approach is made on the left side in patients with an extrahepatic obstruction, whereas the incision is made on the right when the major pathology is in the liver.

In the performance of a splenorenal shunt, splenectomy is first performed and then the end of the splenic vein is anastomosed to the side of the renal vein. The kidney is left intact. When a portal vein-vena cava anastomosis is performed, the upper end of the portal vein is usually sutured to the side of the inferior vena cava. It would probably be more desirable to create a side to side anastomosis since blood could then flow through either channel and the liver would not be completely by-passed, but in many instances it is technically impossible to approximate these two vessels. Vein grafts are now being used in an attempt to overcome this difficulty. The complete occlusion of the portal vein seems to produce no significant adverse effects. In a normal patient, sudden occlusion of the portal vein would cause death, but in a patient with portal hypertension the portal system has been partially obstructed over a prolonged period and ample collateral circulation has already developed. Following operation, there is usually a slight depression of liver function, but this usually returns to the preoperative level within one to two weeks.

It is true that when a portal-systemic shunt is created that it is only the portal hypertension, a secondary phenomenon, which is being attacked. However, a great many patients succumb directly as a result of bleeding from the dilated esophageal veins. If death due to bleeding varices can be postponed or averted, the opportunity becomes available for further treatment and possible improvement of the underlying disease process.

CASE REPORT

History. A. R., an American-born housewife, aged 50 years, was admitted to the medical service of Dr. I. Snapper at The Mount Sinai Hospital, New York, on May 17, 1950, because of a massive hematemesis. This had been her fourth episode over a period of two years. In December, 1948 she had her first massive hematemesis, and this was repeated ten months later and again one month prior to this admission. She had been hospitalized and transfused on each occasion, and large esophageal varices had been demonstrated. There had been no ascites or other associated symptoms. There had been no history of alcohol intake.

Past history. A cholecystectomy for cholelithiasis had been performed ten years ago, and a hysterectomy for fibroids four years ago.

Examination. The patient was in acute distress, vomiting fresh and clotted blood. Blood pressure was 116 systolic and 72 diastolic. The temperature was 100 degrees F.; pulse 100; and respirations 24. The liver was 3 finger breadths and the spleen 2 finger breadths below the costal margin. The remainder of the examination was negative.

Laboratory data. Hemoglobin, 8 Gm.; red blood count, 2.7 million; and white blood count, 7000; with a normal differential count. The urine was negative, and the electrocardiogram was normal. Bilirubin, 1.2; bromsulfalein retention, 48 per cent; cephalin flocculation,

2 plus; thymol turbidity, 3 plus; albumin-globulin ration, 2.6/4.8; alkaline phosphatase, 42 King Armstrong units; prothrombin time, 12.5/12.

Course. The hemoglobin rose to 11 Gm. within two weeks, following several transfusions. One month after admission (June 13, 1950), the patient had another massive hematemesis. She was given several transfusions and an esophageal balloon was inserted into the esophagus. Surgical intervention could no longer be delayed, and she was accordingly transferred to the surgical service (July 5, 1950) for a splenectomy and splenorenal shunt. The operation was performed through a left thoraco-abdominal incision. The spleen was approximately three times the normal size, and it was firmly adherent to all adjacent structures. The liver was moderately enlarged, and it was very finely granular. The veins of the greater omentum and posterior peritoneum were markedly dilated. The portal pressure was 365 mm. of saline. The spleen was removed and the end of the splenic vein was mobilized and then sutured to the side of the renal vein. The kidney was not disturbed.

The postoperative course was uneventful except for a slight increase in jaundice, a low-grade febrile course for several weeks, and a left pleural effusion. The pleural collection was tapped and 180 cc. of clear fluid obtained. The patient was returned to the medical service (July 29, 1950) for a further evaluation of her liver status. The hemoglobin was now 13 Gm., and the white blood count 10,000. The stool was guaiac negative; urine, negative for bile; alkaline phosphatase, 91 King Armstrong units; cephalin flocculation, 2 plus; prothrombin time, 13 seconds; albumin-globulin ratio, 2.4/4.1; non-protein nitrogen, 28. She was sent home (August 8, 1950), afebrile and asymptomatic, but returned to the hospital (April 2, 1951) for further evaluation of the liver status. She had remained completely well, and there had been no further bleeding episodes. The liver was now 3 finger breadths below the costal margin, but the remainder of the examination was negative. The laboratory findings at this time were as follows: Hemoglobin, 13 Gm.; white blood count, 8,000; platelets, 230,000; the urine was negative except for moderate albuminuria; bilirubin, 2; alkaline phosphatase, 76 King Armstrong units; bromsulfalein retention, 43 per cent; cephalin flocculation, 3 plus; thymol turbidity, 4 plus; albumin-globulin ratio, 3.6/5; prothrombin time, 17/13 seconds; intravenous hippuric acid excretion, .9 Gm. The intravenous pyelogram revealed no abnormalities. Esophagrams outlined distortions of the mucosal pattern consistent with the presence of esophageal varices.

Comment: There were no significant differences between the results of the liver function tests performed preoperatively and about one year following operation, except for the definite increase in the serum albumin. It is generally assumed that the albumin level should be at least 3 grams per cent before a portal-systemic shunt is undertaken. This is an excellent general rule to follow. The preoperative level in this patient was only 2.6, but the repeated esophageal hemorrhages precluded any further delay in carrying out the operation. It is apparent that no hard and fast rules can be utilized in evaluating the suitability of a given patient for surgery. Each case must be considered an individual problem.

SUMMARY

The pathogenesis and surgical treatment of portal hypertension are briefly discussed. The rationale of the portal-systemic venous shunts is presented, together with the respective advantages of the splenorenal and portacaval anastomoses. The pre- and postoperative course¹ of a patient with typical portal hypertension are described.

¹ During the preparation of this report, the patient re-entered the hospital (June 21, 1951) with a history of recurrent chills, fever and malaise, of three weeks duration. X-ray studies disclosed a large accumulation of fluid in the left pleural cavity and in the pericardial sac. Aspiration revealed the fluid to be serosanguinous in nature. The patient did not respond to antibiotics (penicillin, streptomycin, aureomycin, terramycin). Smears

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and cultures were negative for tubercle bacilli, and it was assumed that the inflammatory process was on a viral basis. There was a spontaneous recovery at the end of six weeks. Since leaving the hospital (August 4, 1951), she has remained afebrile and asymptomatic.

THE HORSESHOE KIDNEY AND ITS DISEASES*

JOSEPH M. SILAGY, M.D.

The horseshoe kidney is the most common type of bilateral renal fusion and is largely a pathogenic entity. In adult autopsy material, it occurs from 1 in 600 to 1 in 800, while in post-mortem material of children, the incidence is higher, about 1 in 400, suggesting its serious import in relation to survival. Pyelographic data indicate the incidence to be between the two figures noted above.

Horseshoe kidneys result from an embryologic fault, causing a fusion of the two renal blastemata when they lie closest together at about the 5th-6th week fetal life. It is at this time that the renal primordia lie in the hollow of the sacrum. Normally, as the body elongates, the kidneys ascend the lumbar gutters, simultaneously rotating on their longitudinal axes, and come to rest alongside the upper lumbar vertebrae with their pelves and calices pointing posteriorly and outward. If fusion occurs, however, improper ascent and rotation ensue, and the total ensemble of renal mass tends to anchor at a lower level with the pelves remaining in the anterior position. The horseshoe kidney thus lies astraddle of the vertebral column, usually at the level of the 3rd or 4th lumbar vertebra. Ninety-five per cent of cases exhibit fusion of the lower poles with a concavity of the horseshoe pointing upward. The remaining 5 per cent show the reverse situation. The isthmus of the horseshoe kidney is usually composed of parenchymatous tissue; rarely is it represented by a fibrous strand. Indicative of its anomalous development are abnormal vessels which supply it. The arteries are multiple and come directly either from the aorta or the iliacs, and numerous veins empty into the vena cava, or into the iliac vessels. Depending upon what degree of rotation has preceded fusion, the pelves show a variable position, with the ureters emerging either anteriorly or anterolaterally. Uretero-pelvic obstruction of varying degree is not uncommon. The calices are irregular in size and shape and the lowermost ones point inward towards the spinal column. The horseshoe kidney is in close proximity to numerous abdominal nerve plexuses. There are, not infrequently, associated congenital abnormalities in other organs.

The diagnosis of horseshoe kidney is usually made on pyelographic data, although in the spare subject, palpation of an umbilical mass may suggest the diagnosis. The x-ray criteria are: an irregular pelvis and calices, anteriorly placed pelvis, and, most constantly and characteristically, the lowermost calyx points inward. The whole renal mass is usually somewhat low in position and the pyelographic angle erected by drawing a line from the midpoint of the vertebral column at the level of the crest of the ilia to the lowermost calices will be 20° - 30° in the horseshoe kidney as compared to 90° in the normally situated kidney. The ureters in a large percentage of cases take on a "flower-vase" appearance. Presence of calculi in the oblique or transverse position near the spine or over it should arouse suspicion. Abnormalities of the urine are those of complicating diseases processes.

* Presented at the Monthly Urological Conference of Dr. Gordon D. Oppenheimer, on March 28, 1950.

Clinically, cases of horseshoe kidney can be classified into three groups:

1. The anomaly is present without pathologic change and without symptoms—Horseshoe Kidney.
2. The anomaly is present without pathologic alteration but the patient complains of symptoms, usually abdominal pain, constipation and a variety of urinary disturbances—Horseshoe Kidney Disease.
3. The anomaly is present and complicated by any and all disease processes that befall the normally situated organ—Diseased Horseshoe Kidney.

In this hospital, the presence of horseshoe kidney was diagnosed 30 times during a period of 14 years, from 1933 to 1947, inclusive. Of these 30 cases, 7 were entirely asymptomatic and fall into Group I. The diagnosis in this group was made either accidentally as the result of an urogram performed to rule out other conditions, or as an incidental finding at post-mortem examination, the patient having succumbed to an unrelated disease. In a series of 8 cases of horseshoe kidney published by Goldstein and Abeshouse, 2 were asymptomatic.

No instances of horseshoe kidney disease, as described under Group II, were found in our material, and none were present in the 8 cases of Goldstein and Abeshouse previously referred to. Guiterrez, who popularized this appellation, described in his monograph several cases, all of which were treated medically with varying results. Foley, felt that there were cases of horseshoe kidney not demonstrating any pathologic change which produced such severe symptoms as to require surgery. He gathered 19 such cases from the literature and added 7 of his own, in all of which, division of the renal isthmus together with nephropexy of one or both sides was done. Good results were stated to have been obtained in 92 per cent of these cases.

Twenty-three instances of diseased horseshoe kidneys were found in our series, of which 8 were in females and 15 in males. These were found to be complicated by a variety of disease processes as follows:

Chronic Infection—3	Tuberculosis—1
Calculous disease—13	Malignant Grawitz Tumor—1
Uretero-pelvic Obstruction—3	Glomerulonephritis—1

There were 4 deaths in these cases. Heminephrectomy was performed 9 times, 7 times extraperitoneally and twice transperitoneally. The operative procedures were not infrequently difficult because of the troublesome exposure and the hazards of injury to the numerous aberrant vessels and nearby structures.

CASE REPORT

History. W. K. (#603765), a man aged 41 years, complained of pain in the back of two years' duration. The pain was fairly constant but underwent periodic exacerbations of great severity. Attacks started in the low back, in the midline and sometimes radiated anteriorly. There were no urinary symptoms, although at one time "dark urine" was noted after an attack. There was anorexia, constipation and moderate weight loss.

There had been no prior serious illnesses. Venereal disease was denied.

The patient was seen by his physician who, among other investigations, performed an intravenous pyelogram which was reported as horseshoe kidneys without pathologic change. This condition was not regarded as the cause of his distress and he was treated as an ortho-

pedic problem with back supports. He failed to improve and was sent for urologic examination.

Examinations. The patient was a spare, muscular individual. No abdominal masses or viscera were palpable. His blood pressure was 130 systolic and 70 diastolic. The genitalia and prostate were normal. Urinalysis showed an occasional red and white blood cell. The serologic test for syphilis was negative.

Cystoscopy revealed a normal bladder. Retrograde pyelography confirmed the presence of horseshoe kidneys (fig. 1). Films taken in the AP view suggested the possibility of a stone obscured by the spinal shadow (fig. 2). An oblique view (fig. 3) clearly demonstrated a calculus $1\frac{1}{2}$ cm. in size within the right renal pelvis.



FIG. 1. Typical horse-shoe kidney with characteristic pyelographic angle and "flower-vase" appearance of ureters.

Course: Operation was performed by me on November 16, 1949 at the Mt. Sinai Hospital. He was carefully positioned with his back making an angle of 60° rather than the usual 90° to the table, thus making it possible to enter the loin easily and yet gain ready extraperitoneal access to the midline of the abdomen. The kidneys were readily visualized on either side of the spine, forming a classical horseshoe with a thick fleshy isthmus. The right pelvis was anterior, easily exposed, opened, and a spiculated (calcium oxalate) calculus removed. The post-operative course was smooth and the patient left the hospital on the 11th post-operative day in a very good condition. He has remained asymptomatic since, and check up urograms show a normal horseshoe kidney appearance with no recurrence of stone.



FIG. 2. AP projection shows urinary calculus at right margin of L 3, obscured by shadow of vertebral column.



[FIG. 3. Right oblique projection demonstrates calculus clearly within right renal pelvis

SUMMARY

A case of a single stone in the right half of a horseshoe kidney, previously undiagnosed because of the obscuring spinal shadow, is described and a brief review of some of the literature is given.

Horseshoe kidneys are a frequently noted abnormality, having been diagnosed 30 times at the Mount Sinai Hospital from 1933 to 1947 inclusive. Seven of these cases were asymptomatic and required no treatment. The remaining 23 cases were complicated by a variety of disease processes and were treated accordingly. The most common complication was the formation of urinary calculi.

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ABSTRACTS

AUTHORS' ABSTRACTS OF PAPERS PUBLISHED ELSEWHERE BY MEMBERS OF THE MOUNT SINAI HOSPITAL STAFF

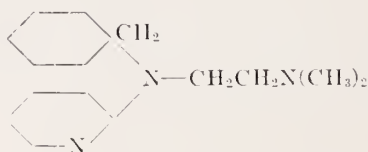
Members of the hospital staff and the out patient department of the Mount Sinai Hospital are invited to submit for publication in this column brief abstracts of their articles appearing in other journals.

Congenital Hemolytic Jaundice in a Negro Family. J. CHURG AND M. ROSENBAUM. *Am. J. M. Sc.*, 217: 383, April, 1949.

Congenital hemolytic jaundice is very rarely found in the Negro race. To the 10 previous cases in the literature, 3 cases are added, encountered in a Negro family consisting of 10 persons. In 2 of them, mother, aged 38 and daughter, aged 9, the disease was quite severe, accompanied by hemolytic crises and typical roentgen-ray changes in the bones of the skull. In the third case, a daughter, aged 5, there were typical blood changes, but as yet few clinical manifestations.

A Quantitative Method for the Determination of Antihistaminic Compounds Containing the Pyridine Radical. E. PERLMAN. *J. Pharmacol. & Exper. Therap.*, 95: 465, April, 1949.

A fluorometric method suitable for the determination of a number of available antihistaminic compounds is described. The test is based upon the observation that cyanogen bromide reacts with these drugs to form a compound which exhibits an intense blue fluorescence when exposed to near ultraviolet light. This test was applied to all of the available antihistaminics and to 2 related synthesized compounds. Fluorescence was observed only in those which contained three Nitrogen atoms in the same configuration as found in Pyribenzamine:



The compounds which contain the pyridine radical alone, developed a color which could be intensified by means of coupling agents such as p-aminoacetophenone. The test was applied to a study of the urinary excretion of Pyribenzamine from patients receiving this medication. No free bases were obtained when such urines were made alkaline and extracted with organic solvents. It was found however, that if such urines were heated with alkali, material could then be extracted with organic solvents which would develop a fluorescence with cyanogen bromide. This material appears to be Pyribenzamine in view of the fact that it could be precipitated as the picrate with the same melting point as Pyribenzamine picrate, and mixed crystals exhibited the same melting point. It was further shown that the isolated material had antihistaminic activity by pharmacological test. The material was also studied at three values of pH in the Beckman ultraviolet spectrophotometer and was found to have identical maxima, minima and isobestic points as found for Pyribenzamine itself. Applying this method to a study of the rate of excretion of single doses of Pyribenzamine in patients' urine, it was found that about 10 per cent of the ingested dose was excreted in 24 hours and that intravenously administered Pyribenzamine was excreted at the same rate and to the same extent as the same dose taken orally.

Two Cases of Acute Diffuse Labrynthitis Following Acute Iritis Media. HARRY ROSENWASSER. *Laryngoscope*, 59: 345, April, 1949.

In this era, with its sharply curtailed incidence of suppurative disease of the mastoid and temporal bone, otologists still occasionally are confronted with cases of acute labyrinthitis and meningitis, or acute labyrinthitis with meningeal irritation occurring early after or together with the onset of an acute otitis media. In the prechemotherapy days, the prognosis in these cases, whether they were treated by conservative or radical surgical measures, was not very encouraging. With the addition of sulfadiazine and penicillin to our armamentarium of therapy, the outlook for preservation of life is no longer the grave concern of former years. The objective of the otologist should now be preservation of life and preservation of function as well, and these objectives seem possible of attainment by the early use of sulfadiazine and penicillin in adequate dosage.

The Heart in Funnel-Shaped and Flat Chests. A. M. MASTER AND J. STONE. *Am. J. M. Sc.*, 217: 392, April, 1949.

Organic heart disease was not present in 25 consecutive patients with this deformity who were referred for consultation because of cardiovascular signs and symptoms. These included a systolic murmur at the mitral and apical regions, precordial pain, shortness of breath, palpitation, dizziness, fatigue, joint pains and fainting spells. Rheumatic mitral valvular heart disease was the most frequent erroneous diagnosis. The signs in a person with a flat or funnel-shaped chest may also simulate congenital heart disease, pulmonary neoplasm, pulmonary congestion or pneumonitis. The diagnosis of a flat or a funnel-shaped chest may be made by inspection of the patient from the side. Roentgenograms and fluoroscopy of the chest afford confirmatory evidence. The ordinary postero-anterior 6 foot roentgen-ray film may miss the deformity.

Deep Vein Thrombosis in a Newborn Infant. M. J. KELLER. *J. Pediat.*, 34: 482, April, 1949.

A 9 day old infant was admitted with signs indicating major venous obstruction in the right leg of only 24 hours duration, but with remarkable superficial collateral circulation over the leg and right side of abdomen. The condition was probably associated with unusual pressure in the inguinal region as the infant was being held for ritual circumcision 24 hours prior to the onset of symptoms.

The diagnosis was confirmed by venogram. Recovery was progressive and complete within 2 weeks, the only therapy being heparinization for first 2 days. This is the first such case reported in this age group, with venous thrombosis in absence of local or systemic infection. Venography in newborn has also not previously been reported.

Diodoquin as a Topical Therapeutic Agent in Cutaneous Disease. K. STEINER, AND W. LEIFER. *J. Invest. Derm.*, 12: 203, April, 1949.

Various quinoline derivatives have been used here and abroad in treatment of skin disease. These include quinolor, vioform, sterosan, and surfen. Diodoquin (5,7-diiodo-8-hydroxyquinoline) had not been used previously in skin disease but had been given orally for amebiasis and vaginally for trichomoniasis. The authors treated 27 patients with diodoquin ointment and lotion with excellent therapeutic response in primary bacterial and fungus infections of the skin, and secondarily infected dermatoses. This is a preliminary report and recommends wider investigation of this drug.

A Modified Synthetic Predigested Aliment for Protracted Jejunostomy Feeding. F. HOLLANDER AND H. A. SOBER. *Surgery*, 25: 580, April, 1949.

In the past, natural foodstuffs fed to fistulous patients frequently resulted in nausea, vomiting, cramps, and diarrhea. Such disturbances, when not a result of the post-operative state, have been related to fat content, pH, osmotic pressure, rate of administration, or

irritant components of the aliment. Several years ago, a diet which overcame these complications was devised for feeding jejunostomy patients for several weeks. Subsequently, it was used for more prolonged periods in patients with anorexia nervosa, cicatricial stenosis of the esophagus with gastrostomy, as well as jejunostomy. However, this preparation contains only the major vitamins, and because of its liquid nature, it must be prepared fresh every day. To improve the nutritional quality, stability, and ease of preparation, the aliment has been modified. It now consists of the following: (1) a dry sterilized mixture of protein hydrolyzate, dextrans, maltose, whole liver substance, and a special salt mixture; (2) an aqueous emulsion of corn and Haliver oils; (3) sterile water; and (4) a suitable preparation of the water-soluble vitamins. The first two of these can be prepared in bulk and stored. For jejunal feeding, the rate is controlled by a special pump. This aliment has been the sole source of nourishment for 19 months in a patient with jejunostomy for obstructed esophagus, and resulted in a weight gain from 80 to 116 lbs during this period.

Acid-Neutralizing Power of Several Protein Hydrolysates and Other Substances Used in Ulcer Therapy. S. M. SAMIS AND F. HOLLANDER. *Gastroenterology*, 12: 665, April, 1949.

Buffer curves were determined for four commercial protein hydrolysates, whole fresh milk, a pharmaceutical alumina gel preparation, and sodium bicarbonate. For purposes of comparison, unhydrolyzed casein, dried whole milk powder, and soy milk powder were also studied. The procedure entailed electrometric titrations with 0.1N HCl under standardized conditions using a glass electrode. Buffering power between the initial pH and pH 3.5 was estimated by interpolation from the titration curves, the latter pH value being that taken as the boundary value between free and combined gastric acidities.

At least three of the protein hydrolysates were found to have sufficient acid-neutralizing power to be effective antacids when taken orally at a dosage of 300 g. distributed throughout the day. Whereas 300 g. of the most effective of these preparations neutralized almost 5500 cc. of 0.1N HCl *in vitro*, this same amount of acid requires 45 g. (about 10 level teaspoonfuls) of NaHCO₃. The protein hydrolysates were found to be generally superior even to the alumina gel investigated, which had previously been demonstrated to be an effective antacid both *in vitro* and *in vivo*. None of the other substances were comparable, even to the alumina preparation, in their acid-neutralizing action.

It is concluded that the acid-neutralizing function of orally administered protein hydrolysates is of major importance in ulcer therapy.

By Paying Less We Pay More. M. R. STEINBERG. *Modern Hospital*, 72: 68, May, 1949.

The proposition that hospital pay scales operate under a benevolent economic law that enables the voluntary institution to pay less than industry for a given amount of work is exploded as somewhat of a myth by the author who cites examples from his own payroll to show that lower-paying hospitals frequently pay as much and sometimes more before they get the job done. In hospitals as in industry, low wages inevitably breed high cost through frequent turnover and re-training, low productivity and poor morale. Administrators are urged to re-examine payroll structures, heeding basic economic laws governing the flow and productivity of labor.

Standardization Procedure for Determination of Aerosol Delivery of Nebulizers by Phenol-sulfonphthalein Aerosols. Preliminary Report. H. A. ABRAMSON, M.D.; C. REITER, M.D.; B. SKLAROFKY, B.A.; AND H. H. GETTNER, M.S. *Ann. Allergy*, 7: 390, May-June, 1949.

By nebulizing a solution of a standard dye, under specific conditions, the quantitative delivery of aerosols by commercial nebulizers may be readily determined. It is recommended that commercial nebulizers be certified as to aerosol delivery by the manufacturer.

Auricular Alternation After Propyl-Thiouracil. B. KISCH. *Exp. Med. & Surgery*, 7: 173, May-Aug., 1949.

A case is presented in which, after three weeks treatment with propylthiouracil, auricu-

lar fibrillation of one year's duration was stopped. Only a few days after discontinuation of the treatment, an electrical alternans of the auricular complex was present in the chest leads, slightly marked also in Lead II. No alternation of the ventricles accompanied this phenomenon.

Electrocardiographic Changes Following Air Embolism in Man. B. KISCH. *Exp. Med. & Surgery*, 7: 73, May-Aug., 1949.

Electrocardiograms were taken repeatedly of a patient who collapsed suddenly, following a perirenal air insufflation for the diagnosis of a pheochromocytoma, during the twenty-four hour period before her death. A complete A-V block, right axis deviation previously not present, and RT deviation of the type of posterior wall damage as occasionally seen in acute coronary insufficiency appeared. Abnormal Q waves in Leads II and III also appeared. Later the RT changes disappeared, only to be replaced by T wave inversions. The Q waves persisted. The similarity of these changes to those observed in animal experiments are discussed. The various clinical symptoms presented by the patient are analyzed in the light of this knowledge.

Hemoglobin Content, Size and Amount of Erythrocytes in Fishes. B. KISCH. *Exp. Med. & Surgery*, 7: 118, May-Aug., 1949.

The hemoglobin content of the blood and the size and number of the erythrocytes of different species of fish have been investigated. As a rule, as in mammals, the species of fish with the highest normal blood count have the smallest, and those with the smallest normal blood count, have the largest red cells. The ratio of the size of erythrocytes and the size of their nuclei is different for different species. The shape of the nuclei of the red cells of fish is typical for different species. They can be oblong (bacilliform) or elliptic or spheroid. The red blood cells and their nuclei in embryos of dogfish are larger and more spheroid than those of the grown specimens. The Selachians investigated have a normal red blood count of 300,000 to 500,000, the Teleostiens, of two to four million, according to our investigations, which are in close agreement with the data referred to in the previous literature. Asphyxiation had in our experiments only slight influence on the red blood count, but bleeding of higher degrees e.g., 3-5 cc. at a time—leads after a few days in the surviving animals to a marked new formation of red cells. The rule concerning the inverse relationship of size and number of red cells in different species of fish is regarded as an instance illustrating a common rule in biology and other similar examples are mentioned from the literature.

Skin Reactions. XVI. Comparison of Antihistaminic Action of Pyribenzamine and Epinephrine Introduced into Human Skin by Electrophoresis. H. A. ABRAMSON AND S. GROSBERG. *Ann. Allergy*, 7: 325, May/June, 1949.

Epinephrine is one of the most powerful antihistaminic drugs, as measured by effects rather than by the definition in pharmacodynamic theory. In order to evaluate the therapeutic possibilities of drugs similar to Pyribenzamine and of epinephrine in the skin, the effect of skin depots of Pyribenzamine hydrochloride and of epinephrine phosphate, administered by electrophoresis, on the production of wheals by histamine superimposed on areas previously treated by Pyribenzamine and epinephrine, was studied. It was found that, weight for weight, epinephrine was approximately 1000 times as effective as Pyribenzamine under the conditions of experiment. In addition, a new effect, the "restoration" effect of epinephrine is described. This restoration effect is the reappearance of epinephrine blanching as long as 5 hours after the histamine has been administered within the blanched area. It is pointed out that the strong antihistaminic action of epinephrine makes clinical trial of epinephrine ointments in the allergic dermatoses a possibility which should be investigated in detail. The "restoration" effect accounts for the prolonged and effective action of topical therapy with epinephrine, as in aerosol therapy of the lungs.

Platelet Thrombosis in Human Hemostasis. H. D. ZUCKER. *Blood*, 4: 631, May, 1949.

The histologic appearance of needle puncture wounds was studied in serial section. In

the skin of normal individuals agglutinated blood platelets rapidly seal the mouths of cut vessels larger than capillaries, while capillaries are sealed by fibrin or by other mechanisms. The puncture tract is normally filled with red cell-fibrin clot; fibrin is not seen in the platelet-plugged cut vessels. Platelet thrombosis does not occur in idiopathic thrombocytopenic purpura, and fibrin fails to form in the puncture tract when muscular vessels are cut. Bleeding time in thrombocytopenia may be normal when only capillaries are cut, since platelet thrombosis is not involved in capillary hemostasis.

Histamine Iontophoresis in the Therapy of Multiple Sclerosis. H. A. ABRAMSON. N. Y. State J. Med., 49: 1150, May, 1949.

Successful reports by Horton and his coworkers in the therapy of multiple sclerosis by the intravenous administration of histamine has led to a program of iontophoretic therapy with strong histamine solutions. It had been shown previously that if histamine is introduced into the human skin by iontophoresis, histamine depots are formed. Eleven patients with multiple sclerosis have been treated by iontophoresis of histamine with sufficiently concentrated solutions and sufficient current density to produce both primary flushes during therapy and, in some instances, secondary flushes some hours later. The data indicate that histamine in the dose and form administered does not produce important changes in the oscillometric index in the arm but does produce a drop in the blood pressure, especially the diastolic pressure. In general, therapy increases muscular coordination, muscular strength, and improvement of vision. The advantages of the therapy proposed are (1) the veins need not be punctured over prolonged periods of time; (2) sterile equipment need not be employed; (3) it is readily administered at home; (4) it is inexpensive; (5) hospitalization is not necessary, and (6) it can probably replace intravenous therapy. On the basis of the data presented thus far, it is believed that prolonged iontophoretic therapy with histamine, possibly combined with vasodilators by mouth, provides a greatly simplified form of therapy with good therapeutic possibilities.

The Treatment of Acute Proctologic Conditions. E. GRANET. Am. Pract., 3: 533, May, 1949.

Acute proctologic conditions should be treated promptly; these include external thrombotic hemorrhoids, anal fissure, anal, perianal and pilonidal abscesses, coccygodynia, acute venereal proctitis, primary anal syphilis and fecal impaction. In these conditions the diagnosis is made by the history and an intelligent physical examination. Prompt treatment by the general practitioner, either surgical or medical as outlined, will prevent the establishment of irreversible complications as well as serious and prolonged morbidity.

The Treatment of Acute Brucellosis with Aureomycin. M. S. BRYER, E. B. SCHOENBACH, R. M. WOOD, AND P. H. LONG. Bull. Johns Hopkins Hosp., 84: 444, May, 1949.

Studies with multiple strains of brucella including both *Brucella abortus* and *Brucella suis* have indicated that these organisms are sensitive to the antibacterial action of aureomycin *in vitro*. 0.25 to 2.0 micrograms of aureomycin per milliliter of medium completely inhibited growth of 11 strains of brucella during the first 72 hours of incubation. Five patients having blood cultures positive for brucella organisms have been treated with aureomycin. All became afebrile and were markedly improved within 48 to 72 hours after the initiation of therapy. Positive cultures were not obtained after treatment was begun. When palpable, the liver and spleen receded during therapy, and further evidence of active disease was not observed. Relapses have not been observed during periods of observations after treatment of from 2 to 8 months. Weight gains of 5 to 40 pounds have been noted during this period. The only toxic reaction associated with oral administration of aureomycin was occasional, transient nausea. The intramuscular injection of the drug, even when dissolved in 1.0 per cent procaine, produced local pain. In all but 1 patient, the initial daily treatment consisted of 2,400 to 3,000 milligrams daily. Supplemental intramuscular injection of the drug was administered to 4 patients. The dosage was usually reduced when the patient became afebrile. Aureomycin therapy was continued empirically for approximately

2 weeks. Supplemental aureomycin injected intramuscularly, may not be necessary for the treatment of brucellosis. The laboratory and clinical observations in these 5 cases of brucellosis would suggest that aureomycin is an effective chemotherapeutic agent in this disease.

The Infusion of Fluids into the Subarachnoid Space of Human Beings. L. LINN. *J. Nerv. & Ment. Dis.*, 109: 428, May, 1949.

Because the brain and spinal cord are enclosed in a non-yielding bony covering, they are peculiarly susceptible to small changes in pressure. This fact underlies the accepted practice of instilling only small quantities of fluid into the subarachnoid space for diagnostic and therapeutic purposes. In a series of preliminary experiments on animals and in a group of 11 patients it was demonstrated that it is possible to inject relatively large volumes of fluids into the subarachnoid space without danger. After a certain volume of fluid was injected, transitory pain appeared in most cases which was characteristic in its location, occurring in the distribution of the lowest sacral and coccygeal nerve roots. The volume of injected fluid necessary to elicit the pain response varied markedly among our patients but seemed to be constant for a given patient. The range was from 20 cc. at one extreme to over 200 cc. at the other. Some of the factors which govern the rate of absorption of saline into the subarachnoid space are reviewed. Some of the therapeutic and diagnostic possibilities of the procedure are discussed.

An Orthopedic and Neurological Follow-up Study of Vertebral Fractures in Shock Therapy. P. POLATIN, AND L. LINN. *Am. J. Psychol.*, 105: 815, May, 1949.

Twenty four patients with vertebral fractures occurring during the course of convulsive therapy were studied approximately 10 years after the initial lesion. On the occasion of the original injury patients who complained of back pain were treated with analgesics and bed rest. No other orthopedic therapy was applied. Four patients complained of occasional, mild non-disabling backaches. The rest were symptom free. In no case was there clinical evidence of orthopedic or neurological sequelae to the original injury. In 3 cases X-ray findings indicated an increase in the original pathology involving the thoracic vertebrae. However, these X-ray changes were not associated with clinical findings. Patients with vertebral fractures tolerated subsequent convulsive therapy satisfactorily. No cure was used either in the original or subsequent convulsive therapy.

Leontiasis Ossea Confined to the Maxilla and Mandible: Report of a Case. L. STERN. *New York State Dent. J.*, 15: 284, May, 1949.

A case of hyperostosis involving the mandible and maxilla, but no other parts of the facial skeleton, is presented. The histopathologic picture showed irregular trabeculation with fibrotic marrow spaces. The cotton-wool appearance of the bone and hypercementosis of teeth were strongly suggestive of Paget's disease, except that this condition rarely involves the mandible or remains limited to the jaws. An atypical case of fibrous dysplasia was ruled unlikely because of the symmetrical distribution. Therefore, the clinical designation of Leontiasis ossea seemed to be appropriate, though not specific, awaiting more exact classification of the facial hyperplasias.

Unilateral Polycystic Kidney Disease. G. D. OPPENHEIMER AND L. NARINS. *J. Urol.*, 61: 866, May, 1949.

A proven case of unilateral polycystic renal disease associated with contralateral renal hypoplasia is described, together with operative and post mortem findings. A detailed discussion of the statistical rarity of this condition is also presented.

Psychosomatic Factors in Essential Hypertension. MACK LIPKIN. *M. Clin. North America*, 703, May, 1949.

This essay, part of a symposium on the clinical features of essential hypertension, deals

with the psychosomatic aspects. The increase in blood pressure after emotional disturbance is well known. Both neural and humoral mechanisms mediate this effect. Numerous studies of the personality profiles of hypertensives are critically evaluated. It is probable that no specific verifiable pattern exists. Psychological factors are crucial in the symptomatology and in the comprehensive diagnosis of the patient with hypertensive disease, particularly in respect to iatrogenic fears. The value of psychotherapy—whether reassurance, advice on relaxation, environmental manipulation or help with conscious conflicts, or other techniques—is stressed.

Treatment of Malignant Diseases with Nitrogen Mustard. N. B. KURNICK, K. PALEY, M. FIEBER, AND D. L. ADLER. *Ann. Int. Med.*, 30: 974, May, 1949.

Sixty-four patients with a variety of malignant diseases were treated with one or more courses of methyl bis (β -Chloroethyl) amine hydrochloride (HN_2). The dosage varied from the previously suggested 0.1 mg/kg body weight to twice this dosage in courses of 4 daily intravenous injections. Brief remissions were obtained in 20 of 24 cases of Hodgkin's disease including several who had become roentgen-ray resistant. With the exception of transitory diminution in the size of metastases of a patient with bronchogenic carcinoma and another with Wilms' tumor, carcinomas were uniformly unresponsive. Reticulum cell sarcoma, lymphosarcoma, mycosis, fungoides and chronic lymphatic leukemia were only fleetingly benefited or failed to respond at all. Chronic myelogenous leukemia failed to respond. One patient with chronic nonleukemic myelosis with marked splenomegaly and myelofibrosis improved dramatically both symptomatically and objectively. Repeated courses of HN_2 occasionally proved of benefit where single courses were without benefit. However, repetition of a course within 2 weeks proved markedly myelotoxic. One fatality occurred as a consequence of this effect. At necropsy, this patient revealed 1 small degenerating splenic granuloma as the only residue of her previously generalized Hodgkin's disease. The relative merits of roentgen ray and nitrogen mustard therapy are briefly discussed.

Homologous Serum Hepatitis in Infants and Children. R. E. MOLOSHOK, S. KARELITZ, AND L. STRAUSS. *Pediatrics*, 3: 651, May, 1949.

Eight cases of homologous serum hepatitis are reported in 7 infants under 1 year of age and in a child of 2½ years. Five of these children died of acute hepatic degeneration. Suggestive evidence has been presented for the implication of ieterogenic plasma in 5 cases. The clinical, laboratory and post-mortem findings of serum hepatitis are described in detail. Preventive measures have been reviewed and summarized. The high mortality in this series suggests that the prognosis of homologous serum hepatitis may be worse in infants although contributory factors, especially preceding debilitating diseases may be partially responsible. The clinical manifestations of serum hepatitis in infancy do not appear to differ markedly from those in adults. Post-mortem findings were characterized by a striking uniformity of the pathologic anatomy identical to descriptions of fulminant cases of infectious hepatitis previously described.

A Survey of 723 Cases of Cholecystitis and Cholelithiasis. R. COLP AND L. J. LESTER. *New York State J. Med.*, 49: 1043, May, 1949.

This survey includes 723 consecutive cases of biliary tract disease which were subjected to operation. There were 88 cases of acute cholecystitis in this series. Management was on an individualized basis. Cholecystectomy was performed in 78 of these patients, cholecystostomy being reserved for the very poor risk cases. Transient jaundice which accompanies acute cholecystitis is frequently due to edema, and does not usually necessitate common duct exploration. There was one death in this group. There were 568 cases of chronic cholecystitis in this series. Stones were present in 94 per cent of cases. Cholecystectomy was performed in 99 per cent of instances. The common duct was explored in 7 per cent, and stones were found in 71 per cent of those explored. There were 3 deaths in this group for a mortality of .5 per cent. Eight cases of carcinoma of the gallbladder were encountered,

with cholelithiasis being present in 7 of them. Pre-operative preparation, anesthesia, operative technic, and complications are discussed. The findings in secondary common duct explorations are presented.

Graves' Disease in Children. ANNE TOPPER. J. Am. Women's A., 4: 181, May, 1949.

From a follow-up study of 12 children treated for Graves' Disease, the author concludes that conservative treatment is indicated when the condition occurs before puberty. The reasons advanced are: 1. Operative mortality is ever present. 2. Post-operative complications and sequelae are more frequent in childhood. 3. Post-operative hypothyroidism may exact a greater penalty in the child than in the adult, since the gland is so important for growth and development. 4. The thyroid gland is not the primary etiologic factor; its removal does not eliminate the cause. 5. There seems to be a spontaneous arrest of symptoms during puberty, when the needs for somatic growth are subordinated to the needs for maturation. Conservative management includes rest, proper diet with adequate vitamin intake, sedatives, psychotherapy, and some antithyroid drug. The drug of choice is propylthiouracil. Whether this will be superseded by radioiodine or by another compound is unimportant. The important consideration is to avoid surgery where possible.

Factors in Amorphous Penicillin G. Influencing Growth of Fungi. S. M. PECK AND K. K. LI. Arch. Dermat. & Syph., 59: 498, May, 1949.

The authors could show that certain lots of crude penicillin especially before the final crystallization was carried out, contained a factor or factors which markedly influence the growth of *T. gypseum* on Sabouraud's medium. This fungicidal as well as fungistatic principle compared favorably with other well known fungicides as far as the formation of trichophytin in Sabouraud's bouillon was concerned. This is important because it is the stimulation of the formation of trichophytin by the various fungicides in the process of killing the fungi which leads or increases the tendency to allergic reaction to fungi, the so-called "ids." When the factors in crude penicillin inhibit the growth of fungi, they do so with practically no formation of trichophytin. This is in contradistinction to a fungicide such as iodine which while it is markedly fungistatic even in low concentration seems to enhance the formation of trichophytin and thus leads to allergic reactions in the treatment of fungus infections. Crystalline penicillin G has no retarding effect on the growth of *T. gypseum* in Sabouraud's bouillon nor does it have a retarding effect on the amount of trichophytin formed.

A Method for the Determination of Aureomycin in the Blood. S. S. SCHNEIERSON AND B. TOHARSKY. J. Bact., 57: 483, May, 1949.

An assay method for the determination of the aureomycin concentration of the blood is described. The procedure is a tube dilution method employing *Bacillus* #5, a soil isolate that appears to be a strain of *Bacillus cereus*. This organism is able to grow readily at room temperature and hence the test is performed between 22-25 degrees C. thereby avoiding the deleterious effect of the routine 37 degrees C. upon aureomycin. 36 samples were prepared with known concentrations of aureomycin, and assayed. Satisfactory correlation between the known concentration and the results of assay was found. Periodic blood levels up to 24 hours after administration were determined in 2 groups of patients receiving 250 and 500 mg. orally in a single dose. A significant level at 12 hours was found in both groups.

Is It possible to Cover the Fenestra Nov-Oralis with Shrapnell's Membrane? An Anatomic Study. SAMUEL ROSEN. Arch. Otolaryng., 49: 529, May, 1949.

In the fenestration operation for otosclerotic deafness, the artificially created fenestra is covered with the tympano-meatal plastic flap. Lempert maintained that Shrapnell's membrane portion of this flap covered the fenestra; that Shrapnell's membrane discouraged the dreaded osteogenetic closure of the fenestra whereas meatal skin encouraged osteogenesis. It seemed anatomically impossible for Shrapnell's to reach the fenestra. The

author therefore measured on the flap the distance from the short process of the malleus to the fenestra in 50 fresh cadavers. In none of the 50 cases reported did Schrapnell's reach the fenestra. This finding was further substantiated by histological specimens.

An Operation for Chronic Primary Glaucoma; Goniodialysis Combined with Sclerectomy and Iris Inclusion. J. LAVAL. Am. J. Ophth., 32: 634, May, 1949.

A conjunctival flap is prepared as for a trephine operation down to the limbus where the corneo-scleral margin is clearly exposed with a Tooke knife. Two mm. above the corneo-scleral margin an *ab externo* incision is made 5 mm. long using the point of a keratome. This incision is carried through the scleral layers until uveal tissue is reached. An iris repositor is then inserted through this wound into the anterior chamber hugging the inner surface of the sclera. The repositor is gently swung from side to side to free the angle (goniodialysis). Two incisions are then made through the scleral lip 3 mm. apart towards the corneo-scleral margin. This tongue of sclera is then excised (sclerectomy). The iris is grasped with iris forceps near the pupillary border and gently withdrawn through the scleral opening. When the black seam of the pupillary border is visible the iris is cut half way across. The piece of iris in the iris forceps is allowed to lie on the sclera, no attempt being made to place the pigmented surface face up or down (iris inclusion). The conjunctiva is then closed with a running silk suture knotted at each end. The operation has been done on 50 eyes of 43 patients whose ages ranged from 43 to 79 years. The tension with miotics before operation ranged from 30 to 80 (Schiotz—normal 25). In no case was the visual field made worse or the visual acuity impaired by the operation. Some cases have been followed for three years and some for one month. One case, a Negro, was a failure having had a prior trephine operation without success also. The operation is advocated because 1) it is simple and requires no great amount of surgical skill; 2) a thick covering of the filtration area is obtained instead of a very thin covering as in a trephine; 3) regardless of the use of gonioscopy before the operation this procedure can still be carried out because the goniodialysis cuts through the filtration angle and any adhesions if present; 4) by using the *ab externo* route for the scleral incision with the keratome the danger of injury to the lens is removed and also one is assured of making an unbeveled incision directly over the filtration angle; 5) the size of the scleral excision, which can be varied to suit the individual case, will be determined by the amount of tension with and without drops.

Influence of Calcium and Magnesium on Eugenol-Induced Desquamation of Mucus Epithelium in Gastric Pouches. S. D. KRAUS AND F. HOLLANDER. Cancer Research, 9: 344, June, 1949.

Experiments were carried out to determine whether calcium and magnesium can reduce eugenol-induced desquamation of gastric columnar epithelium. This was studied by the topical application to dogs' Heidenhain pouches of buffered 1% eugenol emulsions containing these ions at several concentrations. Such eugenol emulsions were found to exercise the same mucigogue and desquamatory actions as did control emulsions containing no added electrolytes. These results fail to give support to the idea of a possible relation between the desquamatory action of this gastric mucigogue and the process of invasion by cancerous tissue.

The Differential Diagnosis of Ulcerative Colitis. B. B. CROWN. Rev. Gastroenterol., 16: 463, June, 1949.

The disease must be differentiated from amebic colitis with its involvement by preference of the cecum of the ascending colon; from carcinoma particularly when multiple lesions are present. The segmental forms of ulcerative colitis must be recognized particularly when only the right and proximal segments of the colon are involved. The late stage requires differentiation from familial, congenital polyposis with superimposed ulcerative colitis.

Suppression of Gastric Acidity with Beta Particles of P 32. N. SIMON. Science, v. 109: 563, June, 1949.

In order to irradiate selectively the mucosa of the stomach, an applicator was devised to apply P 32 topically to the mucosal lining of Heidenhain stomach pouches in dogs. This applicator was a thin rubber bag, on the surface of which a flocculate coating absorbed radio-active phosphorus. Radiation exposures yielding doses of about 20,000 equivalent roentgens was followed by suppression of acid secreted by these Heidenhain pouches in dogs.

Therapy of Asthma with Reference to its Psychodynamic Pharmacology. H. A. ABRAMSON. Bull. N. Y. Acad. Med., 25: 345, June, 1949.

The use of powerful sympathomimetic amines, antihistaminic drugs, sedatives and antibiotics in the treatment of bronchial asthma should be oriented as follows: While it is generally agreed that therapy should not neglect the physiology and the immunology of the patient in the asthmatic state, the personality of the patient cannot be omitted in planning suitable therapeutic procedures. It is neither wise nor desirable for the patient suffering from severe asthma to be reminded of unconscious material that the doctor himself may be aware of. It is more than desirable in our present state of knowledge to use pharmacologically active drugs in connection with the total personality of the patient manifested during the acute asthmatic attack. Whether anxiety, phobia, depression, dependence, hostility, grief, or other pattern dominates the asthmatic attack, the physician should bring into the proper sphere the psychodynamic pharmacology of the drug employed in treating both the asthmatic spasm and the personality of the patient himself. In this way a better understanding of the action of the drugs on the personality of the patient will be obtained with much greater predictability in the therapy of bronchial asthma.

The Problem of Weakness and Fatigue. M. Y. SILVER. Am. Prac., 3: 598, June, 1949.

Weakness and fatigue are more commonly due to functional disorders than organic disease. The more prominent causes of organic fatigue are acute and chronic infections, malignancy states, metabolic disturbances and severe anemias. Some of the common misconceptions about organic factors in fatigue are discussed in detail under the headings of the male menopause, hypothyroidism, hypotension, anemias and avitaminotic states. Weakness that comes on in spells is often due to hypoglycemia and the relationship to meals is of diagnostic importance. The commonest psychological causes of fatigue are anxiety states, depressions, or just plain boredom, due to a stereotyped pattern of daily activity. Fatigue is, to some extent, a disease of civilization related in this country to the rapid tempo of living. The article closes with a few practical suggestions about the management of the psychological aspects of fatigue.

Neurofibromatosis Associated with Tumors of the Optic Papills. J. GOLDSMITH. Arch. Ophth., 41: 718, June, 1949.

A case of bilateral tumor of the optic nerve, involving the papilla and associated with neurofibromatosis in a 26-year-old white man is reported. Unusual associated findings were a neurofibromatous growth in the apex of the right lung, bilateral acoustic neuroma, mental retardation and medullation of the retinal nerve fibers. Other ocular lesions associated with neurofibromatosis are described. The relation of primary tumors of the optic nerve to neurofibromatosis is briefly reviewed. It is suggested that all patients with neurofibromatosis be subjected to a critical ophthalmologic examination.

The Association of Capillary Sclerosis with Arteriosclerosis and Plebosclerosis; Its Pathogenesis and Clinical Significance. E. MOSCHOWITZ. Ann. Int. Med., 30: 1126, June, 1949.

Capillary sclerosis is an invariable accompaniment of the general sclerotic process that affects the vascular system. When the main artery of an organ is affected by arteriosclero-

sis, the distal capillaries reveal capillary sclerosis. This has been demonstrated in the lungs, the pancreas and the kidneys. When the main vein of an organ is affected by a phlebosclerosis, the proximal capillaries also show capillary sclerosis. This has been demonstrated in the liver when the hepatic vein reveals sclerosis and in the spleen when the splenic and portal veins show sclerosis. Evidence has been submitted to show that arterial and venous hypertension within these vessels is the cause of the sclerotic process. In the pancreas and kidney a decrescent capillary sclerosis, that is unassociated with hypertension, may occur. We have reason to believe that this is the result of prolonged normal intraarterial tension, since it is associated with the decrescent arteriosclerosis of advanced years. A decrescent venocapillary sclerosis is probably impossible, since venous pressures are low and even under abnormal conditions never approach the normal systemic arterial pressures. We have not observed decrescent capillary sclerosis in the lung for the same reason, since the pressure in the pulmonary artery is only one-sixth that within the aorta. In the organs affected by arteriosclerosis, the distal capillary sclerosis is the result of forward intravascular pressure; in those with phlebosclerosis, the proximal capillary sclerosis is the result of backward pressure. The capillary sclerosis affects the function of these organs to a greater or lesser extent. Teleologically, the early phases of capillary sclerosis represents a compensatory adaptation to the prolonged arterial and venous hypertension. In the later phases, the decompensating effects of the exaggerated phases of the lesions upon the function of each organ have been outlined.

Vitamin B₆ Deficiency in the Syrian Hamster. G. SHWARTZMAN, AND L. STRAUSS. J. Nutrition, 38: 131, June, 1949.

Male weanling Syrian hamsters were maintained on a purified diet deficient in vitamin B₆. This led to arrest of growth after a depletion period of 2 to 3 weeks, diminished food and water intake, progressive malnutrition, muscular weakness and changes of the fur. Increased quantities of xanthurenic acid were found in the urine. The deficient animals did not survive beyond 12 to 13 weeks. Autopsy showed loss of fat tissue and marked atrophy of the lymphoid tissues, notably the thymus, even when malnutrition was mild. There was arrest of sexual maturation and bone growth. Pair-fed controls receiving 50 mg pyridoxine HCl daily showed arrest of growth and atrophy of lymphoid tissues, but failed to develop fur changes, muscular weakness, or cachexia. Controls fed ad libitum and receiving daily 50 mg of pyridoxine HCl showed good growth and nutrition and normal activity. Their fur was normal and there was no atrophy of the lymphoid tissues. Upon treatment of the deficient animals with daily injections of 50 mg of pyridoxine HCl after a depletion period of 9½ weeks, there were in most animals resumption of appetite and growth, deposition of fat and general return to normal behavior and appearance. Fur changes were repaired within one week of treatment. A single injection of pyridoxine HCl seemed to bring about similar results, the effect lasting for about 2 weeks. Although the presence of unsaturated fatty acids in the diet seemed to delay the onset of deficiency symptoms, the addition of corn oil to the diet of animals in an advanced state of depletion did not have any beneficial effect.

Acute Coronary Occlusion Simulating Acute Abdominal Disease. L. E. FIELD, L. PORBY, AND A. M. MASTER. N. Y. State J. Med. 49: 1419, June, 1949.

Four cases of acute coronary occlusion with the clinical picture of acute intra-abdominal disease are reported. Three patients had pain entirely confined to the abdomen. In each instance the diagnosis was made by the electrocardiogram. Such atypical clinical patterns are prone to develop in hyposensitive individuals. The site of the myocardial infarct, anterior or posterior, had no bearing on abdominal reference. Not only may acute coronary occlusion simulate abdominal disease, but the converse occurs—abdominal disease may clinically resemble acute coronary occlusion and produce electrocardiographic changes characteristic of acute coronary insufficiency. An electrocardiogram should be taken early in every instance of acute upper abdominal symptoms before subjecting patients to strenuous diagnostic procedures or operation.

An Evaluation of the Mumps Skin-Test in Pediatric Practice. A. L. FLORMAN, A. E. FISCHER, AND R. E. MOLOSHOK. Bull. New York Acad. Med. 25: 441, July 1949.

It is concluded that although the test is useful in determining susceptibility to mumps, a positive skin reaction is not the sole indicator of resistance.

Experience With The Kolff Artificial Kidney. A. P. FISHMAN, I. G. KROOP, H. E. LEITER, A. HYMAN, AND H. EVANS. Am. J. Med., 7: 15, July, 1949.

Six patients were treated for acute renal insufficiency by the Kolff Artificial Kidney. One patient was treated twice and is one of the two patients who recovered. The other patients were treated late in the course of their uremia and served to indicate the lack of value of the apparatus when irreversible changes have occurred. The early application of the apparatus to patients in uremia makes it difficult to evaluate the contribution of the dialysis to the recovery of the patient. The incidence and anticipated time of spontaneous recovery from acute renal insufficiency is stressed. The report includes detailed experiences with massive heparin therapy and a critique of advocated regimens for the management of acute renal disease.

Feeding Problems of Psychogenic Origin. A Survey of the Literature. EDWARD LEHMAN. Psychoanalyt. Study Child., 3/4: 461, 1949.

Psychogenic disorders of feeding may occur almost immediately after birth. During infancy, change, including the introduction of new foods and particularly weaning, may induce an emotional reaction against eating. The appetite of a child is affected by his emotions and by his attitude towards the person who feeds him. Excessive attempts to force food by an oversolicitous, rejecting parent may result in anorexia or dawdling, whereas the "self-selection" of foods by the child and the "self-demand schedule" for the infant minimizes difficulties. The love relationship between the mother and baby finds expression in the act of breast nursing. Later in life, eating may be regarded as a sexual act and its inhibition may result in anorexia nervosa, eating phobias and other syndromes. Marked overeating and obesity may also be caused by psychic factors. Oral sadism, often directed at a parent, may result in anorexia because eating is unconsciously equated with cannibalism. Masochistic attitudes with unconscious attempts at self-punishment and suicide may produce poor eating. The suppression of oral activities, for example thumbsucking, or of oral character traits, may cause an inhibition of eating. A displacement to the oral zone of the phenomena of another zone, particularly the anal, may produce eating disorders. In the attitude toward individual foods suggestion and associations play a role, but a frequent factor may be a symbolic significance unconsciously attributed to particular foods because of their appearance and physical properties. A fantasy of contamination may cause the rejection of food. Various possibilities of food symbolism are enumerated with the aid of the available literature. Unconscious attitudes, sometimes opposite poles of the same psychic complex, may be expressed symbolically by food cravings and aversions. Sometimes aversions may result from repressed cannibalistic tendencies.

Should the Community Get its Bill in Advance? M. R. STEINBERG. Modern Hospital, 73: 64, July, 1949.

An idea embodying a new type of financial therapy for voluntary hospitals with limited reserves suffering from recurrent year-end deficititis is set forth in this article with an affirmative reply to its title. Although it has never before been done, such hospitals can get the community to pay in advance, the author holds, by a drive for funds "not only to wipe out the accumulated deficit and to accomplish the usual purposes but also to pay the estimated expenses for a period of at least one year." An outline is offered of a method for pre-determining the quantity of service to be provided within the limits of the accumulated fund.

Hypermetabolism without Hyperthyroidism. S. SILVER, E. B. CROHN AND P. PORTO. Bull. N. Y. Ae. Med., 25: 441, July, 1949.

It is an accepted fact that there are clinical conditions in which the basal metabolic

rate is elevated in spite of the fact that none of the features of hyperthyroidism is present. Clinicians have known for a long time that many of the patients suffering from hypertension, polycythemia, leukemia, malignant lymphomas, generalized or local malignant growths, Paget's disease of the bones, and other diseases frequently present an elevation of the basal metabolic rate. It is also well recognized that these patients do not present the classical signs of hyperthyroidism and the pathological changes in the thyroid gland do not suggest the typical hyperplasia and other alterations of Graves' disease. We have attempted to study thyroid function in this group of patients with elevated basal metabolic rates by determining the level of the non-dialyzable (protein-bound) blood iodine and the urinary excretion of tracer doses of I-131. Both of these methods show constant changes in hyperthyroidism. In this disease the "hormone" iodine is consistently elevated in the blood and the urinary excretion of tracer doses of I-131 is reduced due to the increased avidity of the thyroid gland for iodine. In a series of over 100 consecutive patients suffering from the diseases outlined above whose metabolic rate were elevated and who presented no clinical signs of Graves' disease, the blood iodine levels were determined in all and the I-131 excretion in some. Without exception, the blood iodine levels and I-131 excretion were normal in spite of very marked elevations of the basal metabolic rate. Thus, in hypermetabolic states not due to hyperthyroidism, the function of the thyroid gland is normal as measured by the level of the protein-bound blood iodine and the urinary excretion of I-131. The increased metabolism in these disorders is apparently not mediated through the thyroid gland.

(Note: The foregoing abstract covers also an article on the same topic by the same authors, published in the *Arch. Int. Med.*, 85: 479, March, 1950.)

Treatment of Pertussis with Polymyxin B (Aerosporin). S. KAPLAN, A. E. FISCHER AND J. L. KOHN. *J. Pediat.*, 35: 49, July, 1949.

Polymyxin B, an antibiotic shown to be effective against a wide variety of gram-negative organisms, was used in 84 cases of pertussis. It was given intramuscularly in a dosage of 4.8 mg. per kilogram of body weight per day, (66 cases) and by aerosol inhalation in a daily dosage of 60 per cent of estimated intramuscular dose (18 cases). Blood levels obtained were many times the calculated sensitivity range. Positive nasopharyngeal cultures were obtained, however, in 10 to 21 cases during and after treatment. In the patients grouped clinically as severely and moderately ill, 12 of 36 seemed improved; the course in the remainder was unchanged. Fever, lethargy, irritability and anorexia occurred in 90 per cent of the patients given intramuscular therapy. Transient albuminuria and red and white cells in the urine occurred in 50 per cent of this group. The incidence of these findings was much lower in those patients who received the drug by aerosol, perhaps due to the lower dosage. Because of the failure to obtain a significant improvement and because of toxicity, the routine use of Polymyxin B in pertussis does not seem warranted at this time.

The Incidence of Valvular Heart Disease In People Over Fifty and Penicillin Prophylaxis of Bacterial Endocarditis. P. A. LICHTMAN, M.D. AND A. M. MASTER, M.D.

Penicillin prophylaxis prior to and following operative and diagnostic procedures may obviate the development of bacteremia and bacterial endocarditis. Not only Rheumatic, but any type of heart disease which produces damage of endocardial tissues, particular valvular, may predispose to bacterial endocarditis during post operative bacteremia. A vast variety of instrumental diagnostic procedures and operations which either traumatise mucous membranes or facilitate the entrance of bacteria into the blood stream include (in brief summary) bronchoscopy; operative and diagnostic procedures of the genitourinary tract, gastrointestinal tract and pelvis; otorhinolaryngological and dental procedures. Since endocardial damage is quite frequent, as shown in 406 consecutive autopsies in patients 50 years old or older, antibiotic prophylaxis may obviate development of bacteremia and bacterial endocarditis.

Studies on Inclusion Bodies I. Acid-fastness of Nuclear Inclusion Bodies that are Induced by Ingestion of Lead and Bismuth. M. WACHSTEIN. *Am. J. Clin. Path.*, 19: 608, July, 1949.

Various types of inclusion bodies were examined with the Ziehl-Neelsen technique for acid-fastness. Among those examined, only inclusion bodies produced by the ingestion of bismuth and lead were found to be acid-fast. Aside from the possible significance as to their lipoid content, the Ziehl-Neelsen stain is a convenient method for the easy demonstration of these inclusion bodies.

Vertical Nystagmus on Direct Forward Gaze With Vertical Oscillopsia. M. B. BENDER AND W. F. GORMAN. *Am. J. Ophth.*, 32: 967, July, 1949.

Two cases of vertical nystagmus on direct forward gaze are described in chronic alcoholics with diffuse disease of the brain, spinal cord and peripheral nerves. The patients complained of visual images bobbing up and down, or vertical oscillopsia. Then nystagmus gradually disappeared, as did their oscillopsia. Intravenous barbiturates (which produce nystagmus in a normal individual) and intravenous alcohol, temporarily abolished their nystagmus and oscillopsia. Oscillopsia appears in acquired nystagmus and not in congenital nystagmus. Vertical nystagmus is a sign of disease of the brain stem or—less commonly—of the midline structures of its cerebellum.

The Incidence of Valvular Heart Disease in People Over Fifty and Penicillin Prophylaxis of Bacterial Endocarditis. P. A. LICHMAN AND A. M. MASTER. *N. Y. State J. Med.*, 49: 1693, July, 1949.

Penicillin prophylaxis prior to and following operative and diagnostic procedures may obviate the development of bacteremia and bacterial endocarditis. Not only rheumatic, but any type of heart disease which produces damage of endocardial tissues, particular valvular, may predispose to bacterial endocarditis during post operative bacteremia. A vast variety of instrumental diagnostic procedures and operations which either traumatize mucous membranes or facilitate the entrance of bacteria into the blood stream include (in brief summary) bronchoscopy; operative and diagnostic procedures of the genitourinary tract, gastrointestinal tract and pelvis; otorhinolaryngological and dental procedures. Since endocardial damage is quite frequent, as shown in 406 consecutive autopsies in patients 50 years old or older, antibiotic prophylaxis may obviate development of bacteremia and bacterial endocarditis.

Massive Stilbamidine Therapy of Multiple Myeloma. Report of a Case. R. A. HAEDICKE AND E. M. GREENSPAN. *Am. J. Clin. Path.*, 19: 634, July, 1949.

Massive stilbamidine therapy by intravenous infusion in a patient with diffuse multiple myeloma produced rapid symptomatic remission of generalized bone pain. A total of 14.86 Gm. was administered during a 9-month period without producing any evident visceral toxicity. Basophilic cytoplasmic inclusion bodies were produced in approximately 50 per cent of the myeloma cells during a 2-month period. The patient survived for 23 months from the onset of symptoms and 15 months after treatment was begun.

Recent Experiences with the Corkscrew Bolt in Fractures of the Hip. R. K. LIPPMANN. *Am. J. Surg.*, 78: 54, July, 1949.

Despite the many advances in the therapy of intracapsular fractures, non-union continues common even in the presence of complete viability of the capital fragment. The reserve strength of routine fixative devices is small and if stronger fixation were available, non-union would be less frequent. The corkscrew bolt, properly applied, provides additional strength to the fixation. Proper application of the corkscrew bolt entails the production and maintenance by the device of a firm impaction of $\frac{1}{4}$ inch, without which the instrument holds no more securely than other routine devices. In the insertion of the corkscrew bolt, the importance of high insertion is emphasized. Insertion more than $\frac{1}{2}$ inch below the vastus ridge entails the risk of pulling the capital fragment down rather than into valgus and

favorable position. Since the objective is to secure maximum strength and since the porosity of the bone is very variable, it is wise to employ 2 corkscrew bolts instead of 1, thus providing an extra margin of safety. In the patients treated according to this plan, failures to heal have occurred only in the presence of total necrosis of the capital fragment. Since the incidence of total necrosis was low, the healing rate attained would appear to represent the maximum potential of the patients treated.

The Mechanism of the Structural Changes in Scoliosis. A. M. ARKIN. J. Bone & Joint Surg., 3: 519, July, 1949.

The problem in the pathogenesis of scoliosis has been the mechanism by which functional curves are converted into structural curves, i.e., the mechanism by which bony wedging and deformity occur. An explanation is offered which depends upon the fact that pressure arrests epiphyseal growth. In the erect spine without lateral deviation the weight of the trunk is equally distributed over both the right and left halves of the growing vertebral body. Hence any inhibition of growth due to the pressure produced by superincumbent weight is symmetrical. Once there is a functional curve, then the concavity of the curve bears much more weight than the convexity; growth is inhibited and the vertebral bodies become wedged. As the bodies become increasingly wedged, the curve increases, thus leading to the familiar progressive deformity of scoliosis. The convex side rotation which always accompanies scoliosis is shown to follow from the tendency of the wedged vertebra to be squeezed out toward the higher side due to its shape.

Ergotamine Tartrate and the "2-Step" Exercise Electrocardiogram in Functional Heart Disturbance and in Organic Heart Disease. L. PORDY, J. KOLKER, M. J. BLUMENTHAL, AND A. M. MASTER. Bull. New York Acad. Med., 25: 445, July, 1949.

Patients with functional cardiac disturbances, including chest pain, may present electrocardiographic abnormalities (pronounced RS-T depressions and T-wave inversions) after the "2-step" exercise test which are indistinguishable from those found in organic heart disease. Ergotamine tartrate was employed intravenously in conjunction with "2-step" tests in 10 cases for the objective differentiation of functional from organic heart involvement. However, ergotamine was found to be contraindicated as a routine for this purpose because of its anginal-provoking properties. We have substituted dihydroergocornine (DHO-180), a newer, safer ergot alkaloid, in our further investigation of this problem.

Anal Eroticism and Certain Anorectal Syndromes. E. GRANET AND E. HAMMERSCHLAG. Rev. Gastroenterol., 16: 549, July, 1949.

Certain proctologic syndromes are related to emotional tension states which manifest themselves by projection through anal erotic impulses. The importance of the anal phase of the child's development, and the fixation or regression thereto in certain neurotic or perverted individuals is briefly considered. The psychosomatic concept of mucous diarrhea, hemorrhagic and ulcerative colitis as an expression of deep feelings of guilt, fear or aggression is presented. Similarly spastic constipation, dyschezia and proctalgia fugax and their role as manifestations of "retention phenomenon" are considered. Neurogenic pruritis ani as a manifestation of anal masturbatory impulses is noted with increasing frequency. In this group are classified those anal masturbators who utilize foreign bodies as the active agent. Venereal disease of the anorectum and its widespread occurrence in overt "anal fixated" homosexual males is assuming increasing importance. Even in women, passive anal coitus is not uncommon and must be kept in mind as a source of venereal disease of the anorectum.

The Association of Interatrial Defects and Anomalies of the Osseous System. B. S. OPPENHEIMER, N. S. BLACKMAN, AND A. GRISHMAN. Bull. New York Acad. Med., 25: 442, July, 1949.

The rare association of interatrial septal defects with or without mitral stenosis and congenital osseous anomalies is illustrated by 5 cases. The bony anomalies found were achondroplasia, hypophyseal dwarfism, Klippel-Feil syndrome, polydactyly, syndactyly,

polyphalangism, or various combinations of these. The anomalies are congenital and may be hereditary or familial, or both. The familial occurrence of the skeletal anomalies indicates that the cause can hardly be ascribed to any intra-uterine fault. The presence of an interatrial septal defect in all 5 cases suggests the lesion is rather of genetic than of intra-uterine origin. It may be useful in the anatomical diagnosis of a suspected congenital cardiac anomaly to remember that in the presence of a gross congenital skeletal anomaly an interatrial septal defect or Lutembacher's syndrome should be suspected before any other congenital cardiac defect.

Intra-Arterial Administration of Penicillin with Special Reference to Bone Marrow Concentration. L. BLUM AND S. S. SCHNEIERSON. Arch. Surg., 59: 176, July, 1949.

The rationale of the arterial administration of antiseptic and other substances is discussed. Experimentally, levels of penicillin in the bone marrow following single intramuscular, intravenous and intra-arterial injections were compared. No consistent difference with respect to bone marrow levels could be demonstrated between the intravenous and intra-arterial route of administration. However, an intra-arterial injection following a preliminary intravenous or intra-arterial dose resulted in a concentration of penicillin in the bone marrow far in excess of that obtained by a single injection of the same total dose. The application of these observations to the treatment of infectious processes of bones is discussed.

Oxygen Saturation of Sternal Marrow Blood in Polycythemia Vera. B. M. SCHWARTZ AND D. STAS. J. Clin. Investigation, 28: 736, July, 1949.

Oxygen content, capacity, and percentage saturation of bone marrow blood were determined in man in a group of controls and in patients with polycythemia vera, anemia, and anoxic anoxia. The limitations of the method are discussed. The percentage saturation of bone marrow blood was greater and the arterial-bone marrow blood oxygen difference was smaller in patients with polycythemia vera than in controls. These findings are compatible with either increased blood flow or decreased oxygen utilization by the marrow in this disease. No significant differences were found between anemias and controls, in a small number of cases. In patients with anoxic anoxia the percentage saturation of bone marrow blood with oxygen was lower than in the controls.

Chorda Tympani Nerve Section and Tympanic Plexectomy. S. ROSEN. Arch. Otolaryng., 50: 81, July, 1949.

The chorda tympani nerve graft covering of the fenestra in surgery for otosclerotic deafness was followed by quicker and higher level hearing recovery. Destroying the tympanic plexus relieved tinnitus and deafness in some cases. These phenomena were explained by Schneider's theory of a primitive sonic and equilibratory system derived from the lateral line organs in aquatic vertebrates and carried by the 7th and 9th cranial nerves. According to this theory, the chorda tympani nerve (7th) and Jacobson's nerve (9th) are the persistent derivatives of these nerves in man. After cutting the chorda tympani and Jacobson's nerves, patients with tinnitus, vertigo, and deafness (Menieres') have been relieved.

Roentgenologic Control of Ureteral Calculi on the Operating Table. E. NEWMAN AND L. NARINS. Am. J. Roentgenol., 62: 113, July, 1949.

A method is described whereby a full sized (14 x 17") scout film of the abdomen may be taken under sterile precautions when the patient is on the operating table, in either the AP or lateral prone positions. The usefulness of this method in the surgery of renal and ureteral calculi is indicated.

Hemophiloid Disease. A Hemorrhagic Disease with Prolonged Coagulation Time and a Circulating Anticoagulant. Report of a Case in a female. O. HERMAN DRESKIN AND NATHAN ROSENTHAL. Bull. New York Acad. Med., 25: 457, July, 1949.

A 30 year old white female developed a hemophilia-like disease associated with a circulating anticoagulant. This is the 11th reported case, and the 3rd in a woman. The anti-

coagulant factor was confined to the pseudoglobulin fraction of the plasma. The anticoagulant was thermostable, and non-dialyzable. The anticoagulant was directly antagonistic to anti-hemophilic globulin (Fraction I of Cohn). The patient's plasma was deficient in thromboplastin; there was no increase in antithrombin, conversion of prothrombin was normal, and factor VI of Owren was present. The hemorrhagic phenomena did not respond to blood transfusions, protamine, serum, or antihemophilic globulin. The patient, nevertheless, made a gradual clinical recovery, although the coagulation time remained markedly prolonged (76 minutes).

Special Assistants for Administrators. M. R. STEINBERG. Hospitals, 23: 39, August, 1949.

The hiring of short-term special assistants to handle isolated, non-recurring management tasks that require immediate attention is recommended for hospital administrators who can't get around to them themselves and whose budgets rule out added permanent help on the supervisory level.

Although the author cites the work at Mount Sinai Hospital of two young physicians retained on a temporary basis who solved the problems of penicillin control and public blood bank supervision, he emphasizes that for many management tasks lay assistants might serve an administrator's purposes with equal effect.

A SPECIAL FUND IN MEMORY OF

Dr. Albert A. Berg

A contribution was made to the Journal of the Mount Sinai Hospital as a token of devotion to the departed great surgeon and humanitarian. It is to provide recent graduates of this Hospital with a free subscription to this Journal.

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OPERATION FOR CORONARY ARTERY DISEASE*

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DESCRIPTION OF THE OPERATION

The operation is carried out in two stages. The first stage consists of the placement of a free vein graft between the coronary sinus and the aorta, while the second stage of the operation consists of partial ligation of the coronary sinus at the ostium of the sinus into the right auricle. The purpose of the operation is to deliver oxygenated blood into the myocardium. We have evidence to show that oxygenated blood delivered into the venous system of the heart can protect the heart against occlusion of a major coronary artery.

This operation was developed on dogs by Doctors Eugene Stanton, William Batiuchok, Eugene Leiter, Ferdinand McAllister, David Leighninger, Richard Hahn, Maurice Kim and the author of this report. The developmental problems in the surgical technique will not be discussed here. This operation introduces new problems in the physiology of the circulation in the heart and the answers to some of these problems cannot be given at the present time. Nevertheless, the operation is giving fresh impetus to the study of the circulation in the heart.

The following is a brief description of the operation. The graft is taken from the basilio, cephalic or jugular vein either immediately before operation or in the afternoon before operation.

The patient is placed on the right side. An intercostal incision is made on the left side, between seventh and eighth ribs. The pericardium is opened. Two pieces of orlon are placed around the coronary sinus at a point where it enters the right auricle. Orlon is used because it maintains its tensile strength after having been in the body several weeks. These orlon threads are tucked away between pericardium and heart to be used at the second stage of the operation. A special clamp is placed on the coronary sinus, and the sinus is opened for a distance of about 5 mm. One end of the vein graft is sutured to the sinus, and the clamp is removed from the sinus. A site for tapping the aorta is selected, and a special clamp is applied to the aorta. The aorta is opened for approximately 4.5 to 5.0 mm. The free end of the vein graft is sutured to the aorta. The clamp is removed from the aorta. The pericardium is closed by sutures. The chest wall is closed completing the first stage of the operation. This can be done in approximately two and one half hours.

The second stage of the operation is done three weeks after the first stage. The scar of the first stage is incised and the chest is reopened. The pericardium is opened. The orlon threads are picked up and dissected to the point where they encircle the sinus. A probe measuring 2 mm. in diameter is placed on the sinus, and the orlon thread is tied on the probe. The probe is removed. This produces

* From the Western Reserve University Hospitals.

partial occlusion of the sinus. The pericardium is closed. The chest wall is closed. This, the second stage of the operation, can be done in one and one half hours.

OBSERVATIONS AT OPERATION

The first stage of the operation provides a fistula from aorta through the graft and into the coronary sinus. Most of the blood escapes into the right auricle. The flow is rapid as in an arteriovenous fistula elsewhere. A thrill is palpable over the graft. In several patients with coronary artery disease, pink blood could be seen in the veins on the posterior aspect of the heart at the first stage of the operation. This pinking of the venous system became more marked if the sinus were occluded temporarily by the orlon threads. This observation was not made in normal dogs with normal coronary artery inflow. The explanation for this is not given but the suggestion is made that in patients the pressure in the venous system of the heart might be reduced by the coronary artery inflow disease. A reduced pressure in the venous system should encourage retrograde flow from the coronary sinus into its venous tributaries. The presence of coronary artery disease, therefore, is favorable to retrograde flow in the veins and in this respect to the success of the operation in patients.

TESTS OF BENEFIT FROM THE OPERATION

Before this operation was applied to patients with coronary artery disease, it was necessary to test its benefit on dogs. The test, worked out by the author and his associates in the 1932-1942 period, consisted of ligating the descending ramus of the left coronary artery at its origin in one step. The artery was dissected out. No branches were missed. Aseptic technique was used, and the results were studied with the delayed deaths occurring weeks later being included. In normal dogs the mortality rate from this ligation was 70 per cent and the recovery rate was 30 per cent. All dogs that lived following ligation of the artery showed a definite infarct in the heart. In most specimens the infarct was large. Mortality and infarction provided a basis upon which benefit could be determined.

The test was applied to 40 dogs in which arterial blood was directed into the coronary sinus, and the coronary sinus was either completely or partially ligated at its ostium in the right auricle. The source of the arterial blood was either from the carotid artery or from the aorta by way of the vein graft. In this group of 40 dogs, 36 lived and 4 died following ligation of the test artery.

For comparison the test ligation was done in 10 dogs in which the graft was occluded by thrombosis. These experiments were identical with the others except that the graft was not patent. Seven died and three recovered. This is the same mortality rate as occurred in our series of normal control dogs. In this series the mortality was 70 and the recovery rate was 30 per cent. On the basis of 40 control dogs, there would have been 12 that lived and 28 that died following ligation of the test artery.

The destruction of heart muscle was equally significant. The infarcts in the control group were always definite and frequently extensive involving the entire

thickness of ventricular wall. A gross infarct was present in every specimen in the control group. In the dogs with a patent graft, a gross infarct was absent in over half of the specimens. In most of the other specimens the amount of destruction was limited to rather small areas. It was also possible to make these ligations without significant changes in the electrocardiogram.

According to these experiments, the operation protects the dog against death and against destruction of heart muscle after ligation of the descending ramus of the left coronary artery. Protection against mortality and protection against infarction are the two factors upon which the operation is based. It seems reasonable to assume that oxygenated blood must enter the capillary bed of the myocardium where oxygen exchange is possible. If this does not occur how could these two protections be explained? This is indirect evidence that blood enters the capillary bed but it appears to be the only assumption that can be made.

It might be stated that additional coronary arteries were ligated and the dogs were active and appeared to be in good health. In two dogs all coronary arteries were occluded except the septal branch. In one all coronary arteries were occluded except the circumflex artery which was occluded to a lumen of 1.5 mm. We did one experiment in which all coronary arteries were occluded and the heart kept beating for 35 minutes. There was considerable mortality in accomplishing these extensive occlusions but the fact remains that it was possible to make these accomplishments. In our opinion such accomplishments as these are not possible in the normal unprotected heart.

Additional evidence that blood flows in a retrograde direction and probably through the capillary bed is given by the following experiment which was repeated in several observations. The circumflex artery is dissected free and the proximal end is ligated in a dog in which both stages of the operation had been previously done. The flow from the distal end of the severed artery is observed. When the graft from the aorta to coronary sinus is clamped off this blood from the severed artery is red and flows in small amount. It is arterial blood which no doubt enters the circumflex artery from other coronary arteries by way of intercoronary channels. When the graft is open so that red blood enters the sinus from the aorta then the retrograde flow from the severed circumflex artery is blue. It flows in large amount and can build up a higher pressure. This observation was first made by Hahn in our laboratory. The retrograde flow is augmented because of aortic inflow from graft. It is blue because the oxygen has been taken out of it and, in order for this to occur, it must have traversed a capillary bed where oxygen exchange is possible. We believe that this, together with the demonstrated protection against mortality and infarction, is strong evidence that red blood can traverse the capillary bed in a retrograde direction where it is beneficial. Along with this increased retrograde flow from the graft there is some electrocardiographic evidence of improvement when the graft is open.

THE SIDE-EFFECTS OF THE OPERATION

The operation involves an arterio-venous fistula by leaving the ostium of the coronary sinus partially open. In our experiments the sinus was reduced to a

lumen of approximately 3.0 to 3.5 mm. In patients with coronary artery disease, the lumen was reduced to about 2 mm. A considerable quantity of blood can flow through such an opening, but it would appear that the flow is not great enough to produce clinical manifestations of a fistula except that of a murmur. This aspect of the operation will bear further observation. One might expect the development of an extensive drainage by way of the anterior cardiac veins and by way of the middle cardiac vein. The anterior cardiac veins enter directly into the right auricle. The middle cardiac vein enters the coronary sinus between the orlon ligature and the auricle so that it is not partially occluded. Our observations on this point are based upon the experimental work. We expected to find large drainage channels. In general these drainage channels did not appear to become an important runoff for blood. In our experiments to date, the arterio-venous fistula effect has not been a problem, but it remains a subject for study in patients.

There were three complications which could have prevented the satisfactory development of the operation. These were 1) hemorrhage into the heart muscle, 2) thrombosis in the graft, and 3) intimal thickening of the veins of the heart. All three of these complications were met in the same way, namely, by making the operation into a two stage procedure and by providing an exit for blood by only partially occluding the coronary sinus. A stagnant flow of blood must be avoided. The flow through the graft and veins must be active. The walls of the veins thicken after they are exposed to the increased pressure produced by the first stage of the operation and the veins tolerate the pressure satisfactorily when the pressure is further increased by the second stage of the operation. After the veins have been exposed to the pressure of arterial inflow, they take on the appearance of arteries.

APPLICATION TO PATIENTS WITH CORONARY ARTERY DISEASE

This aspect of the work is divided into an early and a late period. In the early period, dating approximately from January 1948, to December, 1950, only patients who were entirely or almost entirely incapacitated from work were accepted for operation. These patients showed extensive and irreversible damage in the heart. No doubt most of them were poor risks for any operation and, indeed, the damage in the heart muscle in some of these patients was such as to make questionable the degree of benefit that might have taken place if the patient had recovered from the operation. In this group of 12 patients there were 8 deaths and 4 recoveries. Another factor in mortality in this group of patients, aside from extensive disease, was the technical aspects of the operation. Regardless of the experimental background the operation on patients had to be developed: there were problems which had to be solved, and experience was necessary for their solution. In the late period, beginning December 1950, there have been 28 patients operated upon. In this series there were 23 recoveries and 5 deaths, a mortality rate of 18 per cent. Four of the five patients who died had advanced degenerative disease and were completely or almost completely incapacitated. The fifth patient who died had unexplained necrosis of

the graft, a complication which we had not observed previously. This patient had little or no coronary artery disease; extensive adhesions between heart and pericardium were present. It is possible that a latent infection was activated. Of the 23 patients who recovered 13 had both stages of the operation and two have had only the first stage done. The graft was thrombosed in 6 and the graft was not placed in two. In several of these eight patients the alternate operation was done. This consisted of abrasion of heart and pericardium with application of a chemical irritant to produce intercoronary communications.

In these patients the period of time is not sufficient to enable us to make clinical evaluation. So far the results appear to be or actually are favorable. A number of these patients are quite enthusiastic about the result of the procedure. They get satisfaction in describing their improvement and they urge other patients to have the operation done. The importance of scientific measurements of the results is recognized and such measurements will be carried out. In making clinical appraisal one can err in either direction and this is to be avoided. Both time and additional experience are necessary to determine the benefit of this operation on patients.

CONCLUSIONS

An operation for coronary artery disease is described. The development of this operation required years of experimental work. The benefit of the operation has been tested and measured on dogs and was found to be significant. The application to patients has been made with considerable mortality in bad risk patients, but with more acceptable mortality in patients who are not completely incapacitated. The operation on patients has not been completely developed. The problem of thrombosis exists in some cases. No doubt, this obstacle can be overcome. Another problem is to determine the results obtained in patients and to find out whether the benefit to the dog can be duplicated in the patient with coronary artery disease. In order to accomplish this, the operation will have to be done on a larger number of patients.

THE SIGNIFICANCE OF THE HETEROTRANSPLANTABILITY OF HUMAN CANCER*

A SUMMARY

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Following the demonstration that human cancer possessed the ability to survive and to grow in animals of alien species (1, 2 and 3), a series of investigations was instituted in an attempt to determine the significance of this property. The investigations to be reported concern its specificity and were designed to answer two questions: first, whether the ability to grow in foreign hosts was limited to cancer or shared by other tissues; and second, whether or not the property represented a general and essential attribute of cancer. The first series of experiments involved the testing of various tissue states and a comparison of their transplantation reactions with those of cancer, while the second group was concerned with the heterotransplantability of a large number of human cancers.

In the first series of investigations, the reactions of normal adult tissue, embryonic tissue, benign tumor tissue and cancer tissue to autologous, homologous and heterologous transfer were determined. The anterior chamber of the eye and the brain were used as transplantation sites, and although differences in the incidence of takes and rate of growth occurred in individual cases, the basic factors determining the success or failure of transplantation appeared to be identical in both sites. All of the tissues survived autologous transfer (table I). Adult, embryonic and cancer tissue grew on homologous transfer, while benign tumors and precancerous states failed to survive, and heterologous transfer was successful only in the case of embryonic tissue and cancer (fig. 1).

Special significance is attached to the fact that precancerous lesions cannot be transplanted to unrelated animals of the same species (homologous transfer), whereas later developmental stages of the same tumor, morphologically characterized as cancer, grow readily. For example, fragments of a rabbit breast papilloma obtained at biopsy are easily transplanted elsewhere in the same host or to other rabbits bearing breast papillomas, but always fail to survive transfer to normal rabbits. In contrast, at a later stage of development when the papilloma has advanced to cancer and attained the ability to invade and to metastasize, transfer to normal animals is readily effected. It would appear that growth and development of the papilloma are dependent on factors resident in the natural host or in other animals bearing similar tumors and that such factors are not present in normal animals. Growth, therefore, does not occur in normal

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animals, but with continued development the tumor becomes independent of these factors and will grow in normal animals. Further, the independence attained is such that species variations as well as individual constitutional differences are no longer barriers to transplantation, and growth occurs on transfer to alien species.

TABLE I
The Transplantation Reactions of Various Tissue States

	AUTOLOGOUS	HOMOLOGOUS	HETEROLOGOUS
Adult tissue.....	+	+	-
Embryonic tissue.....	+	+	+
Benign tumors and precancerous states.....	+	-	-
Cancer.....	+	+	+

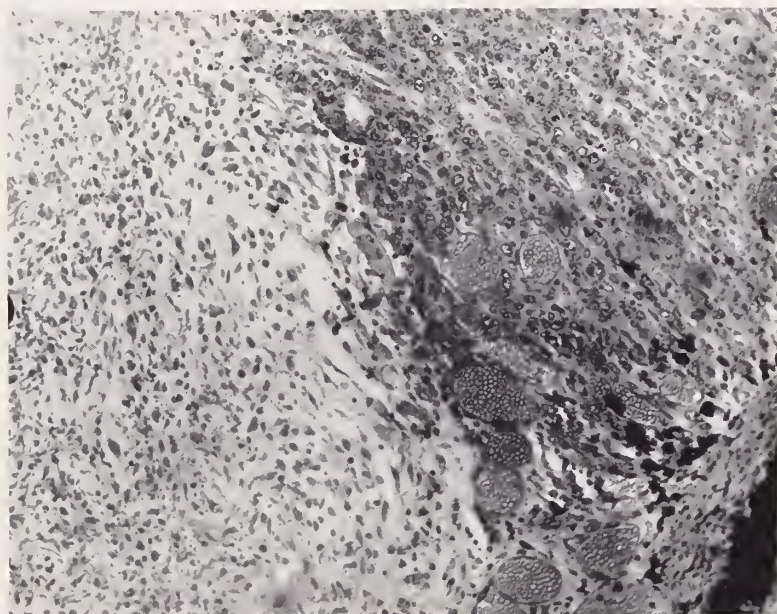


Fig. 1. Transplants of a mouse neuroblastoma, C1300, and the Rous chicken sarcoma growing together in the guinea pig's eye. $\times 200$.

It should be emphasized that comparable phases of dependency and autonomy have been found to distinguish the developmental course of all other animal tumors studied. A comparable investigation of human tumors with autologous and homologous transfers is obviously impossible; but considerable information can be obtained from the transplantation of successive biopsy specimens secured at intervals throughout the period of development. Several experiments of this type have been completed and the results indicate a complete parallelism with the tumors of rabbits and mice. That is, the human tumors were not trans-

plantable to guinea pigs at early stages of development, but they became transplantable during their terminal stages.

The ability to grow embryonic organs and tissues on homologous and heterologous transfer is of more than passing interest. The transplants differentiate and organize into functional structures (4). Thyroidectomized rabbits with transplants of embryonic thyroid maintain a normal serum iodine. Alloxan treated mice cease to excrete sugar after the transfer of embryonic pancreas. Further, bilaterally adrenalectomized guinea pigs have been maintained in health for many months following the transfer of embryonic rabbit adrenals. In the latter cases, death occurred within five days after removal of the transplants.

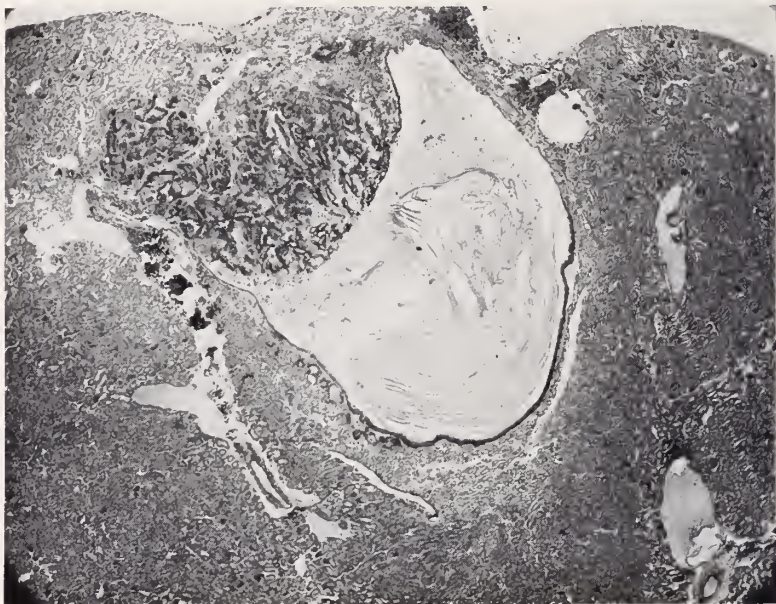


FIG. 2. Embryonic mouse stomach with a crystal of methyleholanthrene imbedded in its mucosa transplanted to the kidney of an adult mouse. The animal was killed 45 days after transfer. Note the adenoacanthoma developing in the gastric mucosa and invading the adjacent kidney. $\times 200$.

The embryonic tissues and organs can be transferred to various sites according to need, and by this means relatively inaccessible organs can be made readily accessible. Embryonic stomachs can be transplanted to a subcutaneous site rendering biopsy or other study a simple procedure. This is especially pertinent in the study of carcinogenesis, and it is enhanced by the fact that embryonic tissues are highly susceptible to chemical carcinogens (fig. 2).

Other fields of investigation are opened by the heterotransplantability of embryonic tissue. One such study at present in operation, concerns the action of infectious agents on embryonic tissues of a susceptible species transplanted to a resistant species. For example, the Rous sarcoma virus does not induce neoplasia in the mouse, but if fragments of embryonic chick tissue are infiltrated

with the virus and transplanted to mouse brains, the Rous sarcoma develops in the transplants (fig. 3). It is noteworthy in this connection that human organs and tissues can also be transferred to alien hosts if obtained before the end of the fifth month of gestation. In this manner human tissues can be made available for experimentation.

The point to be emphasized in the present context is that the property of heterotransplantability is not limited to cancer but is shared by embryonic tissue. Normal adult tissue, benign tumors, precancerous states, chronic granulomata and hyperplastic lesions will not survive heterologous transfer, and the fact of growth in an alien host identifies a tissue as either cancerous or embryonic.



FIG. 3. Fragment of chick embryo infiltrated with Rous sarcoma virus and transplanted to the brain of an adult mouse. The mouse was killed 20 days after transfer. The Rous sarcoma has developed in the perichondrium of a fragment of cartilage and is invading the adjacent brain. $\times 75$.

In effect, heterotransplantability constitutes a biological test for cancer, for a differentiation between cancer and embryonic tissue is rarely a matter of practical consideration. From a biological point of view, however, the identity of the transplantation reactions of embryonic tissue and cancer is a significant finding and suggests a common factor. Actually, the similarity of the two tissues is not limited to transplantation reactions but is also shown by morphological, biochemical and immunological comparison. In reality, the only striking difference relates to the fact that in the primary host and in the experimental animal, embryonic tissue undergoes differentiation, while cancer does not. It would appear therefore that the step from embryonic tissue to cancer is a relatively short one and probably concerned with the process of differentiation. Accordingly, one of the endeavors of our laboratory has been to inhibit or to modify

the differentiation of embryonic transplants in the hope of thus producing a cancer.

In the second series of investigations, a group of 125 different human cancers was subjected to heterologous transplantation, and the results obtained are shown in table II. Sixty-five of the tumors grew in alien species, while 60 failed to survive such transfer. It is apparent, therefore, that although cancer constitutes the only tissue state other than embryonic, capable of heterotransplantation, not all morphologically diagnosed cancers possess the property of

TABLE II

Relationship between the Results of Heterologous Transfer and the Fate of the Patient

	HETEROTRANSPLANTABLE	NON-HETEROTRANSPLANTABLE
Dead	57 (5.08 mo.)*	11 (38.4 mo.)
Living	8 (13.8 mo.)	49 (32.8 mo.)

* Average survival periods computed to October 15, 1950.

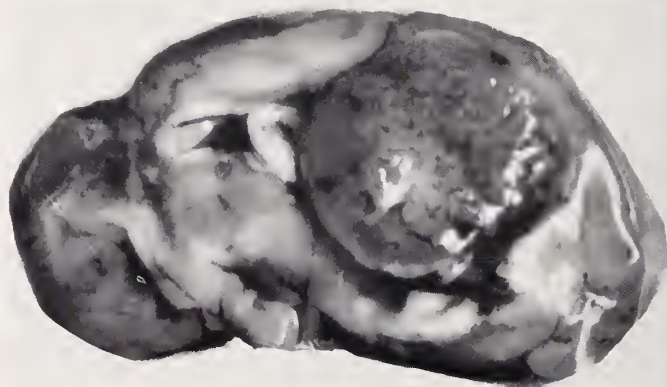


FIG. 4. Cross section of guinea pig brain bearing a transplant of a human glioblastoma multiforme. The animal was killed 94 days after transfer.

heterotransplantability. It should be emphasized that the tumors in the series were all cancers from a morphological viewpoint and that no difference in degree of differentiation or organization or in mitotic index distinguished the transplantable and non-transplantable groups.

Although the groups differing in respect to heterotransplantability, show no corresponding morphological variations, an investigation of the fate of the patients demonstrates a significant biological difference. Of the 65 patients with heterotransplantable tumors, 57 are dead and 8 living. Five of the living patients are known to have metastasis, one is under treatment for recurrent growth, and only two remain clinically free of tumor. In contrast, only 11 of the 60 patients with non-heterotransplantable tumors are dead, while 49 are still living

and as far as can be determined from clinical records are free of disease. There is also a disproportion in the survival periods of the patients in the two groups. The interval between transfer and death averaged five months when the tumor proved to be transplantable, but was increased to 38 months when the tumor proved not to be transplantable. In brief, heterotransplantable tumors are associated with a rapidly fatal course while patients bearing non-heterotransplantable tumors survive for considerable periods of time. It is suggested that a division of tumors on a basis of heterotransplantability signifies different phases of development with the non-transplantable tumors representing early developmental or dependent stages and the transplantable tumors a late or autonomous stage.

Present investigations are concerned with a more precise definition of the relationship between heterotransplantability and immediate prognosis, and while data are still incomplete, a possible interpretation of the findings is that the properties of heterotransplantability and metastasizability are attained simultaneously by the tumor and that in practice, the demonstration that a tumor possesses the ability to grow in an alien species signifies that it has metastasized in the primary host.

From a clinical point of view, heterologous transplantation can be utilized as an aid to the microscope in the diagnosis and prognosis of human cancer. It is also of value in relation to classification for anaplastic human tumors often show a higher degree of differentiation and organization in the heterologous host than is found in the biopsy specimen. However, the major significance of heterologous transplantation lies in its application to cancer research. Human cancers can be grown in laboratory animals and are available for experimental investigations of a type not permissible in man (fig. 4).

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MECHANISM OF BIOLOGICAL EFFECTS OF RADIATION*

BERNARD S. WOLF, M.D.

There are, at present, an overwhelming number of observations on the effects of radiation on all types of living material. Many of these observations have been made, not so much to investigate effects of radiation *per se*, but incidentally in the use of radiation as a tool to enter into the intimate physiological processes of living materials in order to determine their nature. It has turned out that these two types of investigation complement each other very well, since attempts to explain the effects of radiation cannot be completely successful until the nature of living processes themselves is understood. Theories of the mechanism of biological effects of radiation, therefore, are of considerable basic significance and interest.

Basic research scientists will probably never be content with any description of the action of radiation on living tissue until it can be expressed in mathematical equations describing the energy changes. Radiation physicists are well acquainted with the mechanism of energy transfer to various shielding materials under the action of many different types of radiation, but the possibility of producing significant physical or chemical changes in these materials is not considered unless the intensity of the radiation is, by biological standards, tremendous. The amount of energy transfer involved in producing distinctly detectable biological effects is amazingly small. This fact can be brought out in various ways. For example, the 50% lethal dose of whole body irradiation in the case of the human has been estimated to be approximately 400 r. This represents an energy absorption by the whole body of about .06 of a (large) calorie or the energy represented by 15 milligrams of carbohydrate. The lethal dose of radium stored in the bones may be as low as 1 microgram. This represents an energy release of less than 1.5 millionths of a (large) calorie per day. One can calculate approximately how many ion pairs are formed in tissue as a result of 100 r. Such a calculation indicates that about 1 molecule out of every 100 million will be ionized by such a dose, or, in other words, assuming a radiochemical yield of 1 molecule changed per ion pair formed, less than a milligram of tissue is directly destroyed by a total body dose of 100 r. Forssberg (1) has reported a change in the growth rate of a single cell with a dose of 0.001 r, and Sievert (2) has reported changes in the duration of the life cycle of *Drosophila melanogaster* with 0.005 r. Any theory of the mechanism of action of radiation must explain how such small energy transfers may be effective biologically.

It has been generally assumed (3) that the most important phenomenon involved in producing biochemical changes in tissue under the influence of ionizing radiation is the production of ion pairs rather than excitation of specific bonds. Partly for this reason, a sharp distinction has been made between ionizing and non-ionizing radiation. There is no doubt that such a distinction is justified since non-ionizing radiation, such as ultra-violet radiation, produces its effects almost

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exclusively by excitation of identifiable specific bonds in specific molecules. The possibility of adding a large amount of energy in a single interaction event to an atom or molecule exists only with ionizing radiation since it is with this type of radiation that the energy of the incident quantum is considerably larger than binding energies. As a result, a non-specific type of change is likely to occur in the sense that the effect of different qualities of ionizing radiation is quite similar. Since this is the chief reason for differentiating between these two types of radiation, the possibility that excitation of non-valence electrons as well as ionization may play a significant rôle in the action of "ionizing" radiation should not be excluded (4).

There are a large number of experiments on the effects of radiation on chemical systems, such as solutions of oxidizing and reducing agents and of enzymes. These have been well described by Dale (5, 6), Weiss (7, 8), Lea (9), and Forssberg (10). It is an undoubted fact that dilute solutions of some pure enzymes and amino acids may be destroyed quite efficiently by radiation, or stated differently, that small doses of radiation, as little as 5 r, will produce marked chemical change. The amount of such change in dilute solutions is independent of the concentration of the dissolved material over a large range. This type of observation can only be interpreted on the basis that the primary action of radiation is on the solvent, the concentration of which remains constant, rather than on the solute, the concentration of which is changed by a large factor. This mechanism of primary action on the solvent, specifically water, goes under the name of the "indirect action of radiation." This indirect action of radiation must play a significant rôle in tissues since about 80% of the molecules in tissue are water molecules. A mechanism by which ionization energy absorbed by water molecules appears as chemical change of dissolved molecules was postulated originally by Fricke (11) and amplified by Weiss (12). This mechanism has been described in several papers and there is no reason to go into detail at this point. In effect, the ionization of water molecules produces potent oxidizing and reducing chemicals in the solution, specifically hydrogen atoms, hydroxyl radicals, and hydrogen peroxide. These "active" agents are then believed to diffuse for considerable distances on the atomic scale (about 100 water molecules) and interact with dissolved solutes to an extent dependent upon oxidation-reduction potentials. A mathematical presentation of this theory has been prepared by Lea (13) but the fact that this theory is incomplete has been recently emphasized by Read (14) who points out that insufficient attention has been paid to the local electric fields which must be produced if these activated products are to diffuse any significant distances. The necessity for modifying this theory has also been recently emphasized by Dale (15) who points out that many yields, such as those found in deamination of amino acids, are considerably higher than can be explained by the theory in its present form.

A modification or addition to the classical theory of indirect action of radiation is suggested by Krenz (16) who describes a possible alternative mechanism, based on suggestive experimental evidence. This author points out that, because water molecules are in reality associated with each other in large chains, the absorbed

energy will be distributed throughout many atoms along this chain, in small amounts in any particular bond. As a result, water itself is quite stable, but it appears that at points where these chains are "interrupted" by dissolved ions, energy may be transferred to the interrupting ion and chemical change result. While the details of such a mechanism are not too clear, the emphasis on the transfer of energy along chains of associated molecules may be a significant contribution, since many such aggregates exist in biological systems. There is no doubt that in the future, considerably more attention will be paid to methods by which small amounts of energy are transferred between such aggregates and to the effects of orientation of large molecules on energy absorption and resulting chemical change. This is also suggested by the experiments of Mazia and Blumenthal (17) who demonstrated marked decrease in radiosensitivity of a pepsin-egg albumin monomolecular film when orientation in the film was changed by increasing the surface pressure.

The reason for discussing first the indirect action of radiation is the fact mentioned above, namely, that living materials are composed of 80% or so of water. Energy absorbed by the water of a living cell is not likely to have any significant biological effect unless it is reflected in changes in more essential and less numerous molecules of a cell. It is logical to assume that the biological effects of radiation are due to chemical changes in molecules or structures which are peculiarly vital to the function, growth or reproduction of a cell, for example, enzymes, hormones, genes, mitochondria, or other regulating materials of unknown nature (plasmagenes?). Chemical changes in nutrients or substrates would seem not to be of great importance (18), since such materials are continuously and rapidly replaced. The required concentration or number of these "regulating materials" seem to be fixed within narrow limits in many cases. This is of course obvious for nuclear genes, represented at the most by a single pair in each somatic cell.

The important molecules in a cell are, in general, complex organic molecules containing many atoms in specific orientation. One of the obvious ways in which ionization or excitation of an atom within such a molecule may produce a considerably magnified effect would be the destruction of the entire molecule as a result of such an event involving only one of its atoms or bonds (19). This apparently does occur in some cases since it has been demonstrated that ionization of a single constituent atom of a large molecule (e.g. a crystalline virus or a gene) is frequently sufficient to cause decomposition of the entire molecule (20). Moreover, a mechanism appears to exist whereby smaller amounts of energy than that involved in the ionization event can be distributed throughout such a molecule and thereby come to bear upon the weakest link in the chain. The evidence for this possibility is that, the more complex the molecule irradiated, the less varied are the reaction products (21), indicating that only a few bonds are involved, specifically those bonds requiring the least energy for their destruction.

The theory of the "direct action of radiation" is based on the hypothesis that ionization or excitation may be localized in particularly sensitive or vulnerable portions of a cell. This theory has the advantage that it is not necessary to in-

produce an intermediary transfer of energy via other molecules. The destruction of a large molecule by a single ionizing event at some site within it, is an example of the direct action of radiation. The sensitive volume concerned is the so-called target and the general theory has been called the target theory. It is, however, also possible for *several* ionizing events to be localized in a small volume because of the fact that, as is well known, ionization in tissue occurs along the paths of ionizing particles (22). In the case of irradiation with x- or gamma rays, the ionization occurs along the paths of the "associated corpuscular emission," that is, electrons produced by the incident photons. The paths of such ionizing particles are well demonstrated in Wilson cloud chamber photographs. It is obvious that the energy concentrations along such paths is considerably higher than values calculated on the basis of homogeneous energy absorption. Moreover, when such an ionizing path crosses a unit structure such as a chromosome, it is possible for a considerable amount of energy in the form of dense linear ionization to be localized at the site of crossing. Breakage of the chromosome may therefore result and such breakage disturbs the function of the entire chromosome and of the cell in mitosis—again a remarkable magnification of a localized effect. Chromosome (or chromatid) breaks are of course well known as one of the chief effects of radiation of cells (23, 24) and it has been demonstrated that approximately 20 ion pairs are required at the crossing in order to produce a break (25). Since different types and energies of ionizing particles produce different densities of ionization along their ionizing paths (26), it is possible to develop a general theory describing the number of so-called "hits" required in a given sensitive volume to produce a given change (9, 27). As a result of experiments with these different qualities of irradiation, the sizes of these sensitive volumes or targets have been calculated in specific instances, for example, the size of viruses, and it has been possible to confirm such calculated sizes by other methods of measurement. In fact, in the case of vaccinia virus, such studies predicted that the sensitive volume was smaller than the overall size of the virus particle measured in a different fashion and as a result the presence of an internal structure in this virus was predicted (28). Such structure was later found as a result of electron micrographic study (29).

While these theories are helpful in attempts to visualize the chain of events in biological material initiated by absorption of ionizing radiation, namely 1) ionization or excitation, 2) chemical change, 3) biological effect, nevertheless, numerous objections to both the indirect and direct mechanisms have been raised. A basic defect in the indirect theory seems to be the fact that, in a mixture of materials such as exist in any living cell, there are dissolved substances which exert a marked "protective effect" (30). While the destruction of enzymes by radiation may be highly efficient if the enzyme is pure, the addition of small amounts of other biological materials, such as glucose or nucleic acid, remarkably decreases the enzymatic inactivation obtained. While this decreased effect on the enzyme is associated with an increased effect on the "protective material", the overall biological effect is likely to be less since the competing materials present in large amounts are not likely to be particularly essential to the func-

tioning of the cell. In a general way, however, this indicates the possibility of selective action on organic molecules that are stronger reducing agents than their neighbors. Dale (6) suggested that radiosensitivity and radioresistance might be explained on this basis and pointed out the experiments reported by Evans (31) et al. on sperm suspensions of the sea urchin *Arbacia*. In these experiments, the constitution of the suspending medium played an important rôle in determining the effect of radiation on the fertilizing power of the sperm. Seminal fluid and egg water decreased the sensitivity of the sperm, i.e. "protected" the sperm, when compared with sea water. In these same experiments, however, no protection against delay in cleavage after fertilization was noted and therefore cleavage delay may be interpreted as due to direct action on the sperm rather than indirect action via the suspension medium. These protection effects have also been demonstrated with viruses and bacteriophages.

It is also clear that there are many radiation effects which cannot be explained on the "direct" theory without introducing arbitrary assumptions related to the number of hits required or the size of the sensitive volume. In addition, the discovery of radiomimetic drugs such as the nitrogen mustards, which also produce genic mutations and chromosome breaks, throws suspicion on the necessity for a very localized effect. The distant action of radiation demonstrated by Hevesy (32) and others is in direct contradiction to the "direct" theory. The direct theory suggests that very little can be done to affect the results of radiation. On the other hand, the possibility of affecting radiation reactions by medication or by changing environmental conditions, e.g., by decreasing the oxygen tension, appears more hopeful on the indirect basis.

It is also true that no specific biological effect has been described in detail or in such a fashion that the mechanism can be completely understood. Zirkle (33) takes a very dim view of the possibility of achieving this in the near future. There have been few specific suggestions made as to the organic constituents primarily involved in radiation reactions. J. S. Mitchell (34), Hevesy (35) and others emphasize the failure of production of desoxyribosenucleic acid in irradiated tissues. Barron (36) emphasizes the radiosensitivity of sulfhydryl enzymes. The possible rôle of phosphate transferring enzymes and the failure to synthesize organic phosphate bonds may be mentioned as well as the possibility that hydrogen bonds vital to the maintenance of the architecture of proteins may be significantly involved.

Finally, it must be admitted that little practical application of the results of such theories and experimentation has been made in radiology up to the present time. Nevertheless, as in the study of science in general, important applications are likely to occur when least anticipated, provided there are investigators interested in both the clinical and laboratory aspects of the problem.

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THE VALUE OF INTRACARDIAC AND ESOPHAGEAL LEADS IN THE ANALYSIS OF COMPLEX ARRHYTHMIAS*

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Conventional electrocardiograms, especially chest leads, usually suffice for the elucidation of the mechanisms of most arrhythmias. Occasionally one encounters instances in which the clear demonstration of atrial complexes is lacking. Butterworth and Poindexter (1) have emphasized the fact that esophageal leads may yield definite atrial complexes and thus allow adequate analysis. By esophageal electrocardiography Nyboer and Hamilton (2) have demonstrated intrinsic deflection of the atrial complexes in atrial flutter-fibrillation. Levine and his associates (3) have applied an intracardiac exploring electrode to study the displacement of the cardiac pacemaker with the carotid sinus and ocular reflexes.

Out of a large number of cases with various arrhythmias studied during the past three years with intracardiac and esophageal leads, six cases are presented to demonstrate the relative value and dependability of this method.

CASE REPORTS

Case 1. History. J. R., A 50-year-old man, had been followed for the past 7 years in the Out-Patient Department of The Mount Sinai Hospital with a diagnosis of chronic rheumatic valvular defects, mitral stenosis and insufficiency, and aortic stenosis and insufficiency. For the past three years he became subject to frequent episodes of palpitation. At no time had there been congestive heart failure. Conventional electrocardiograms showed periods of apparent sinus arrhythmia or what might appear to be periods of sinus arrest. Occasional premature beats were seen which resembled ventricular extrasystoles. Several esophageal leads and intracardiac leads were obtained, the latter including exploration of the pulmonary artery and right ventricular and right atrial cavities. Only right atrial electrocardiograms will be utilized for the discussion.

Figure 1 A: The tip of the exploring electrode was at the region of the sino-atrial node when the illustrated electrocardiogram was obtained. Two atrial complexes of sinus origin (A_1 ; A_2) are each followed by a ventricular complex in a normal fashion. The second ventricular complex is followed by an atrial complex (A_3) of aberrant origin. It is premature 0.30 sec. after the Q of the preceding complex) and is not followed by a ventricular complex (blocked atrial premature contraction). After an incomplete compensatory pause a P(A_4)—QRS complex of normal origin and configuration follows. The simultaneously recorded chest lead V_1 shows no atrial deflections corresponding to the blocked premature atrial complex recorded with the intracardiac lead, thus simulating either marked sinus arrhythmia or sinus arrest.

Figure 1 B: The exploring intracardiac electrode was at mid-right atrial level. An atrial complex of biphasic configuration is followed by a ventricular complex. 0.29 sec. after the Q wave of the preceding QRS complex an atrial complex of aberrant origin and bizarre configuration is recorded. A ventricular complex of normal configuration follows 0.38 sec. (The normal A—V conduction time averages 0.16 sec.) An atrial complex is seen superimposed on the terminal (R^1) deflection of the ventricular complex. It is regarded as

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originating in the sino-atrial node since its timing falls within the encountered variations of the P-P intervals. No representation of these two atrial complexes is seen in the simultaneously recorded chest lead V_1 .

Figure 1-C and D: The exploring electrode was again at right mid-atrial level. The first normal complex is followed by an atrial premature beat which is followed by an aberrantly conducted ventricular complex. Simultaneously recorded chest leads V_1 and V_5 revealed a ventricular complex whose configuration would lead one only to designate it as of ven-

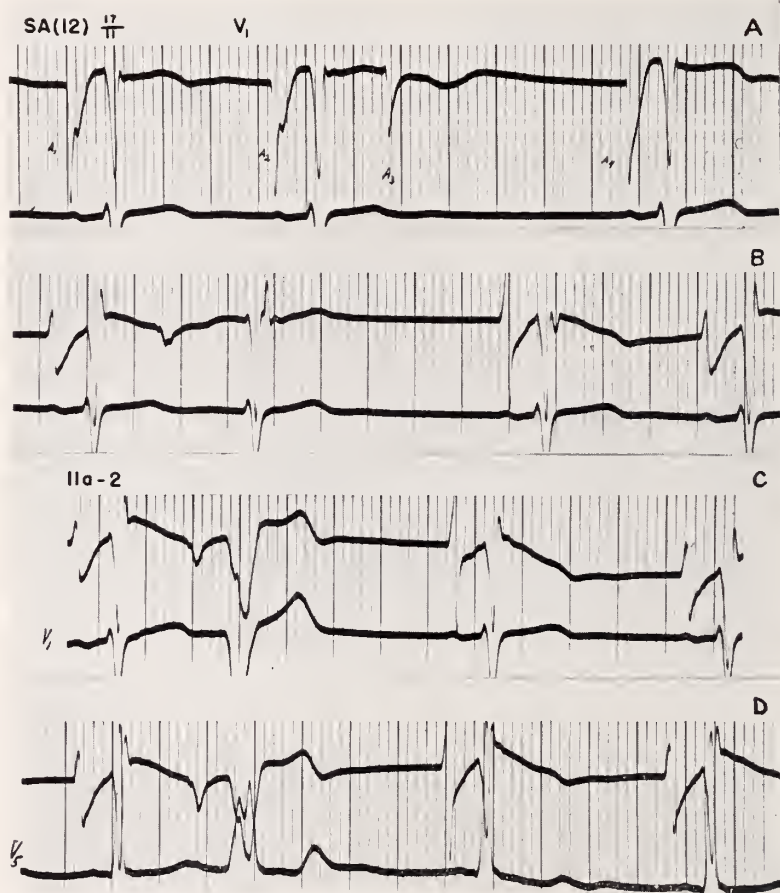


FIG. 1. J. R. (case 1) Atrial premature contractions. (See text for detail)

tricular origin. The preceding T wave showed a notching which might suggest the presence of a superimposed atrial complex.

Case 2. History. P. A., A 64-year-old man was first admitted to the hospital because of squamous-cell carcinoma of the soft palate. Incidentally, frequent ventricular premature contractions were observed with occasional short runs of ventricular tachycardia. Neither cardiac symptoms nor cardiac insufficiency was present. Because of the transitory nature of the arrhythmia, treatment was not required.

Eight months later the patient was readmitted in mild congestive heart failure and frequent prolonged attacks of palpitation. Esophageal leads clearly demonstrated atrial flutter as the underlying mechanism of the arrhythmia. The heart failure rapidly responded

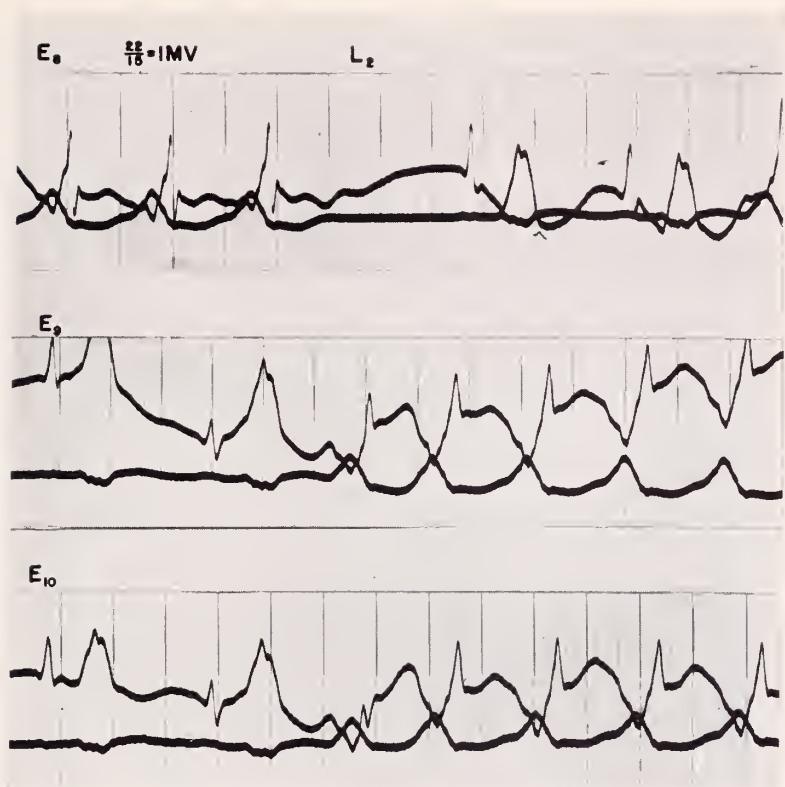


FIG. 2. P. A. (case 2) Esophageal leads obtained at atrial level reveal no activity of the sino-atrial node during the runs of ventricular tachycardia but retrograde activation of the atria.



FIG. 3. Spot roentgenogram indicating the position of the intracardiac electrodes

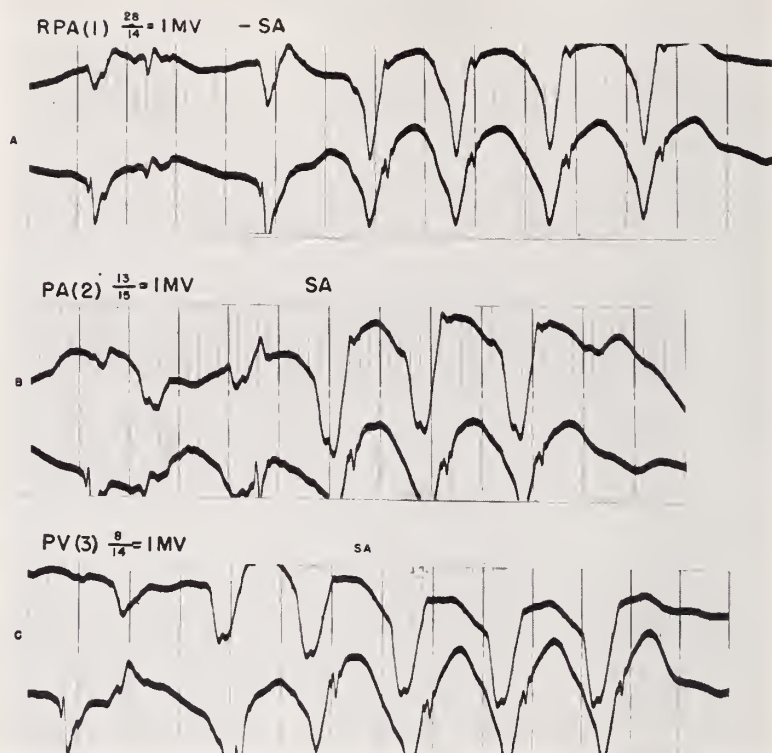


FIG. 4. Intracardiac leads demonstrate ventricular tachycardia with retrograde excitation of the atria.

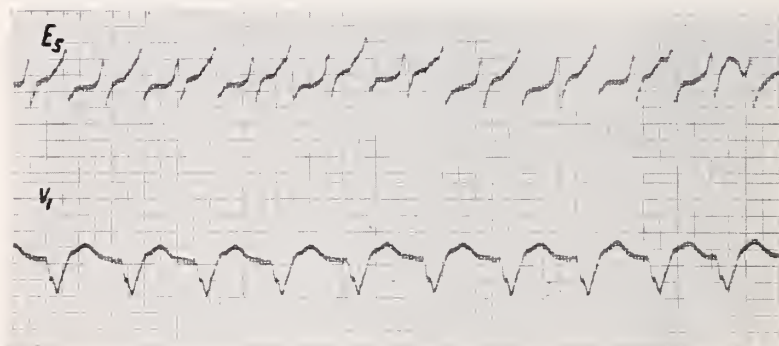


FIG. 5. Atrial flutter with a 2:1 response is well demonstrated by esophageal leads from atrial levels.

to digitalization with strophanthin and digoxin but there was little effect on the arrhythmia. The patient died suddenly on the eighth hospital day. Postmortem examination revealed the presence of calcific aortic stenosis.

The conventional electrocardiogram taken during the first admission showed regular sinus rhythm with frequent ventricular premature beats and occasional short runs of ventricular tachycardia. Left bundle branch block was present. Esophageal leads obtained at atrial levels (fig. 2) demonstrated that during the runs of ventricular tachycardia no sinus activity is seen. The excitation of the atria occurred in retrograde fashion from the ectopic ventricular beats. Lead 2, simultaneously recorded, does not demonstrate this mechanism nor was it seen in any of the chest leads.

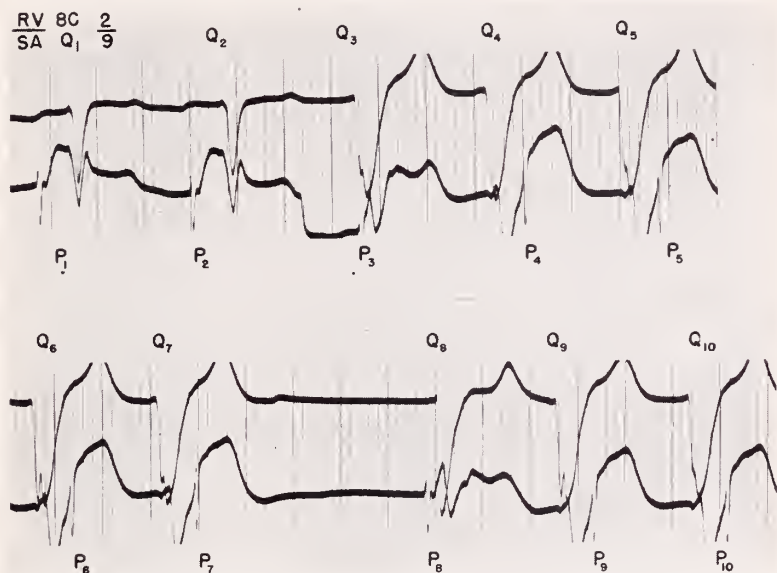


FIG. 6. J. K. (case 3). Ventricular ectopic rhythm is associated with retrograde stimulation of the atria.

Intracardiac electrocardiograms were obtained after introducing two catheter electrodes, allowing one to remain at the sino-atrial node region, the other being used as the exploring electrode (fig. 3).

Tracings from the right pulmonary artery, main pulmonary artery, and pulmonary conus regions (fig. 4), using chest leads V_1 , V_5 , and the sino-atrial node lead as reference, showed the following. Well-defined atrial complexes (1) are recorded from the right pulmonary artery and the sino-atrial node region. Incidentally, the complexes of the latter show the negativity ascribed to the activity of the sino-atrial node itself. A ventricular complex of low amplitude follows. The succeeding atrial complex (2) is not conducted to the ventricles. A short run of four ventricular ectopic beats is then seen. Each is followed by an atrial complex, indicating retrograde atrial excitation with suppression of the activity of the sino-atrial node. The findings in the main pulmonary artery as well as the pulmonic conus were similar in regard to the arrhythmia. It may be noted that there were QS complexes recorded within the right ventricular cavity when regular sinus rhythm was present.

During the patient's second admission, several esophageal electrocardiograms were obtained during the prolonged episodes of paroxysmal tachycardia now present. They



Fig. 7. M. P. (case 4). Regular ventricular rhythm without discernible atrial activity. QRS complexes of Wilson-type right bundle branch configuration.

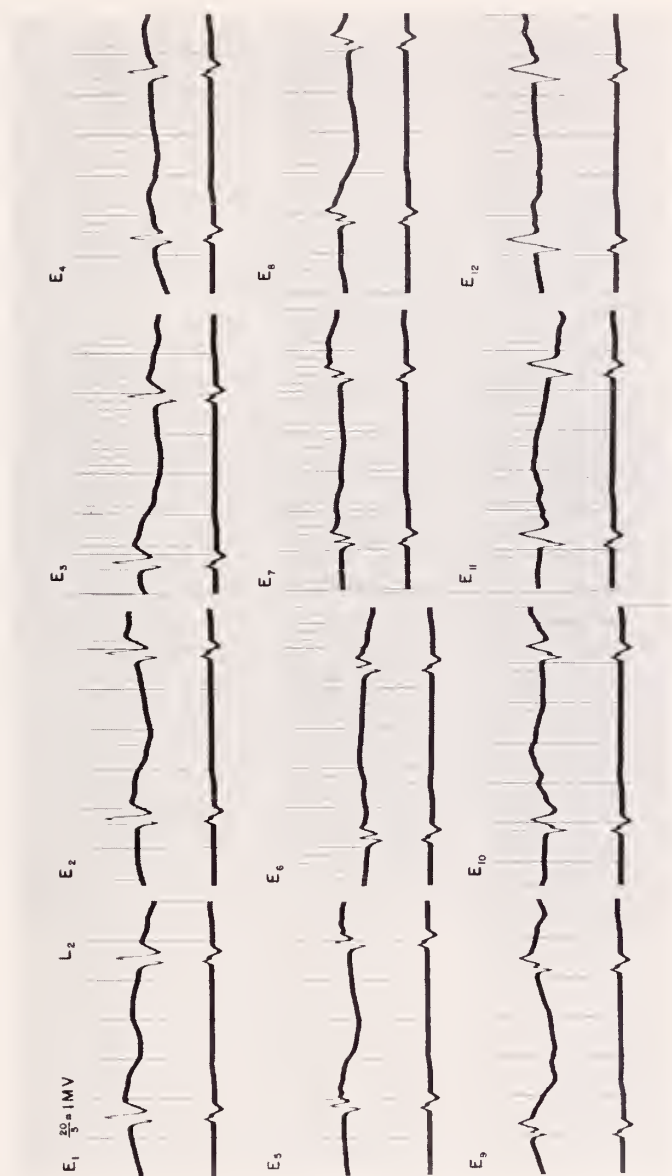


FIG. 8. Several esophageal leads also fail to demonstrate any atrial activity

showed atrial flutter complexes which were not discernible at all in the conventional leads (fig. 5).

Case 3. History. J. K., A 39-year-old man was known to have had a cardiac murmur since earliest childhood. The physical and laboratory findings were suggestive of a congenital stenosis of the left ventricular outflow tract (subaortic stenosis). Angina pectoris of effort existed for the past five years.

During intracardiac exploration, mechanical stimulation of the interventricular septum produced by contact with the electrode tip resulted in short runs of ventricular tachycardia (fig. 6). The ectopic ventricular complexes are of RS configuration measuring 0.16 to 0.18 sec. with elevated RT segments and upright T waves. Simultaneous records obtained from

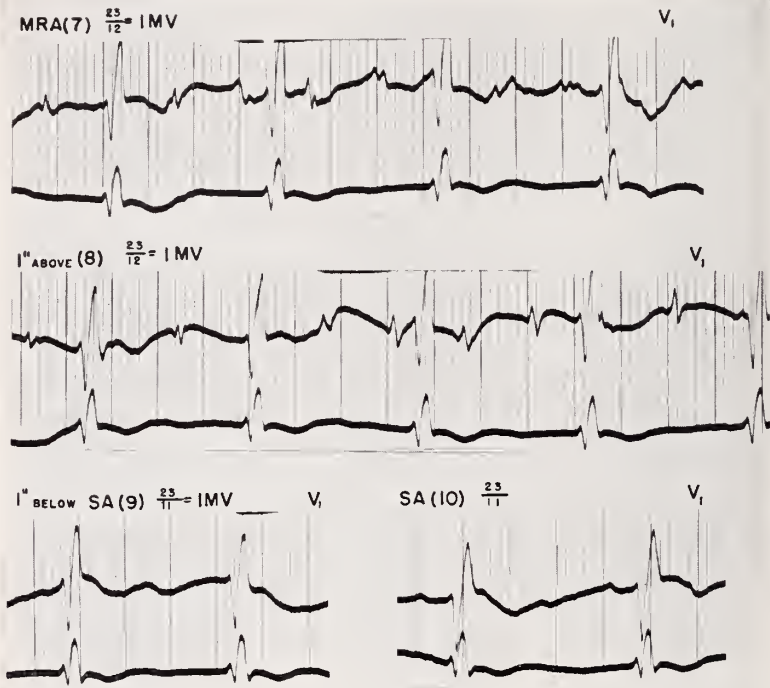


FIG. 9. Atrial complexes, although of very low amplitude, were well demonstrated at two levels of the right atrium.

the region of the sino-atrial node (SA) employing a second intracardiac electrode, showed the following. Two atrial complexes arising from the sino-atrial node are followed in normal fashion by ventricular complexes (P_1 , Q_1 , P_2 , Q_2). The conduction of the third atrial complex (P_3) is intercepted by a premature ventricular complex with aberrant conduction (Q_3), which initiates a short run of ventricular tachycardia (Q_{4-7}). These ventricular complexes are followed by atrial complexes (P_{4-7}) resulting from retrograde conduction. During this period sino-atrial node activity was suppressed. After a quiescent interval, there is resumption of sino-atrial node activity as indicated by the atrial complex P_8 , which is again intercepted by a premature ventricular complex (Q_8) which, in turn, also initiates a short run of ventricular tachycardia showing the same characteristics previously noted. The mechanism was not disclosed in simultaneously recorded chest leads V_1 and V_5 . The true nature of the arrhythmia would have remained obscure except for analysis of records obtained by means of a second intracardiac electrode placed at the sino-atrial node region.

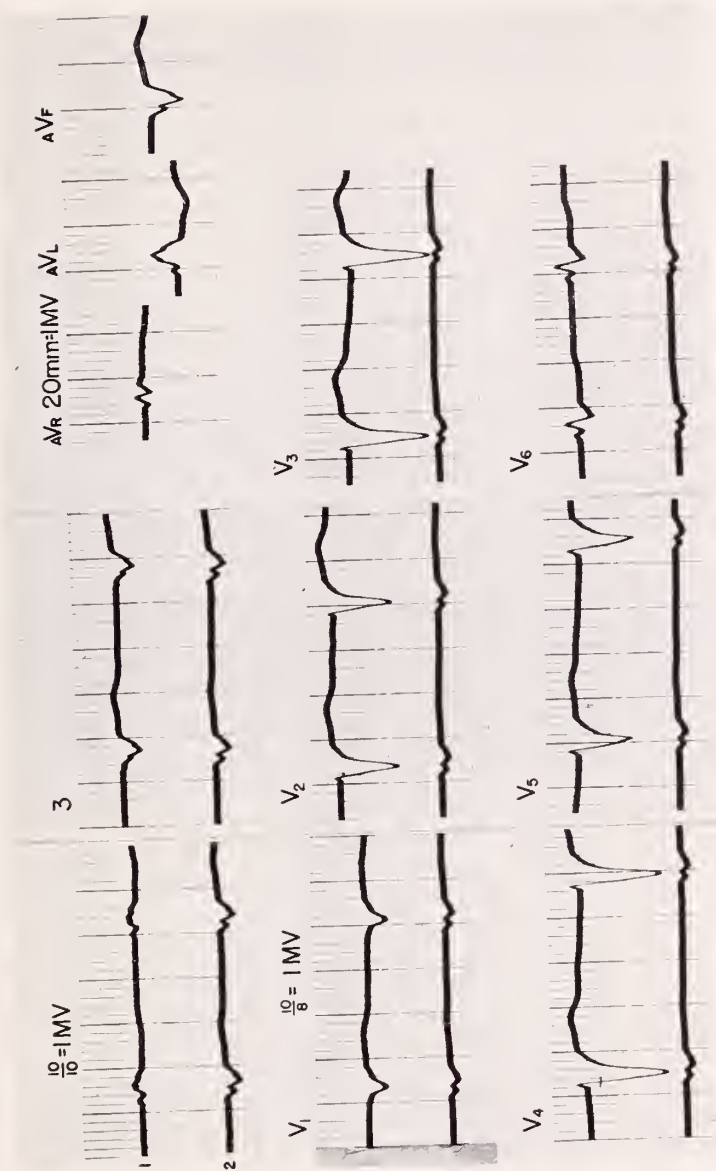


FIG. 10. R. S. (case 5). The conventional electrocardiogram revealed a slow, most often regular ventricular rhythm without discernible atrial activity.

Case 4. History. M. P., A 64-year-old woman was admitted to the hospital for the treatment of congestive heart failure due to arteriosclerotic and hypertensive heart disease.

Conventional electrocardiograms (fig. 7) including chest leads showed regular rhythm without discernible atrial activity. The ventricular complexes had the configuration of a Wilson type right bundle branch block. Several esophageal leads, E_{1-15} , (fig. 8) also failed to demonstrate any atrial activity. Intracardiac electrocardiograms (fig. 9) obtained from the pulmonary arteries, right ventricle, and right atrium revealed atrial activity only at two atrial levels and in the pulmonary artery just above the pulmonic valve: atrial tachycardia (rate—200 beats per minute), complete heart block and idioventricular rhythm were present. It is noteworthy that in this case, only the intracardiac leads yielded evidence upon which the exact analysis of the arrhythmia was made possible.

Case 5. History. R. S., A 59-year-old man was admitted for the treatment of advanced heart failure due to arteriosclerotic and hypertensive heart disease.

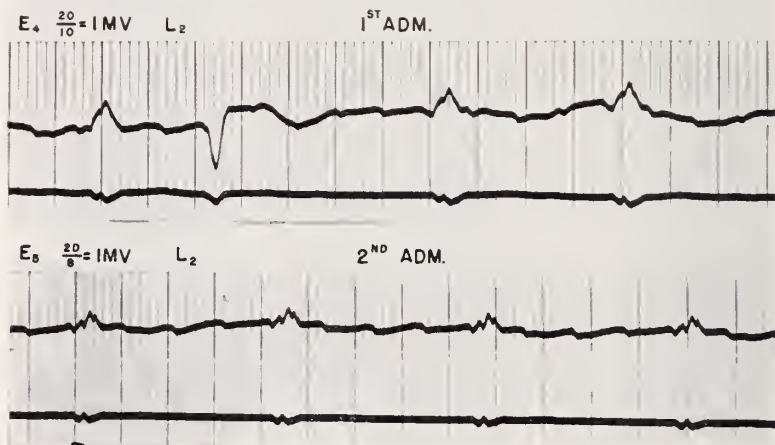


FIG. 11. Atrial flutter waves became visible by means of esophageal leads obtained at atrial level.

Conventional electrocardiograms (fig. 10) showed most often a regular rhythm without discernible atrial activity and left bundle branch block.

Esophageal leads (fig. 11) at level E_4 and E_5 revealed atrial flutter complexes of very low amplitude with slightly varying ventricular response. Repeated attempts to demonstrate atrial complexes by means of numerous precordial leads at various levels failed. Intracardiac leads were not obtained.

Case 6. History. S. T., A 63-year-old man was admitted for the treatment of an acute gastro-intestinal hemorrhage due to duodenal ulcer of 14 years duration. During the preceding 3 years, he also had been complaining about frequent episodes of palpitation which were associated with weakness, pallor, sweating, and substernal pressure. After the intestinal bleeding had ceased, a study of his heart was begun.

Several conventional electrocardiograms (fig. 12) obtained prior to esophageal and intracardiac electrocardiography revealed most often a regular rhythm with a rate of about 100. Atrial complexes could not be seen with certainty. After intracardiac catheterization, the ventricular rates were noticed to vary between 100 and 150 beats per minute.

Esophageal leads (fig. 13) at atrial levels revealed atrial complexes with a rate of 205 beats per minute and a predominantly 2 to 1 atrio-ventricular response. During intra-

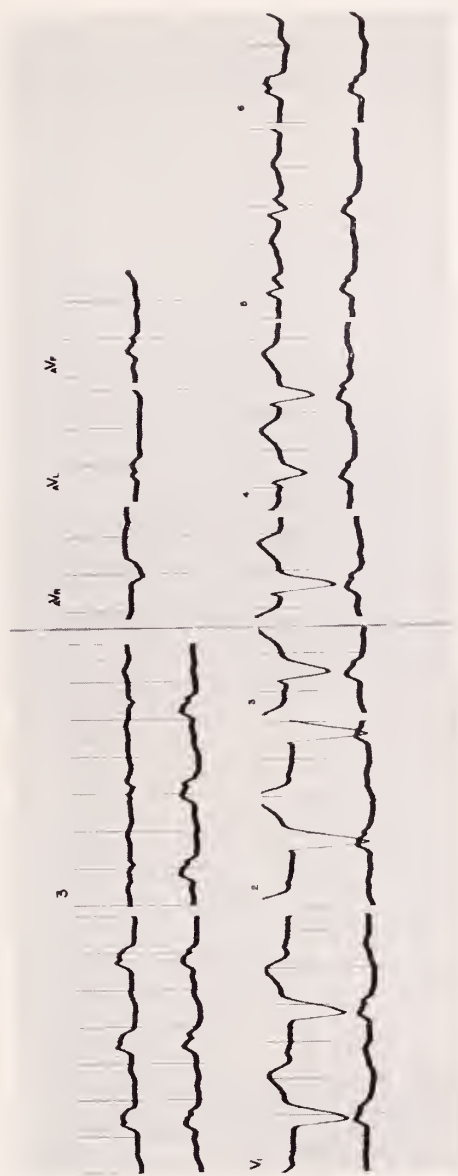


FIG. 12, S. T. (case 6). Regular ventricular rate (about 100 beats per minute) were most often observed. Atrial complexes could not be seen with certainty.

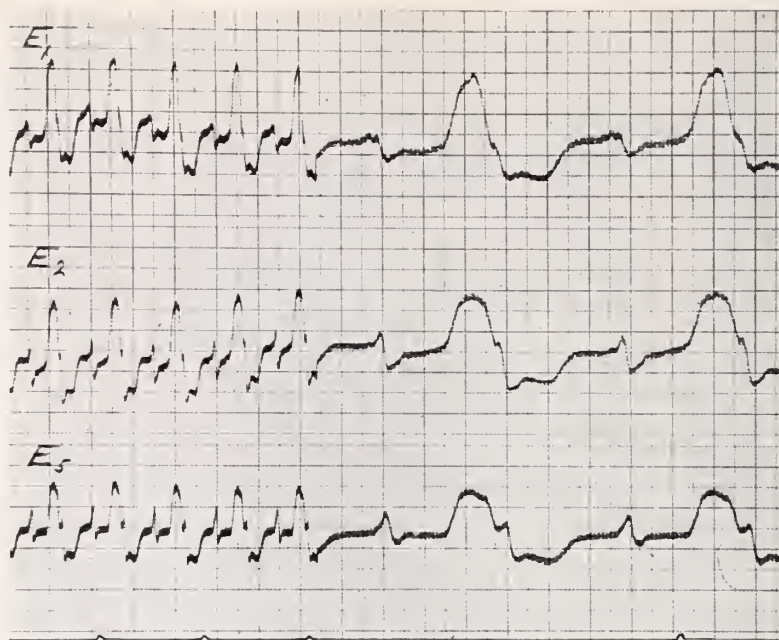


FIG. 13. Esophageal leads at atrial levels reveal atrial tachycardia with a 2:1 atrio-ventricular response.

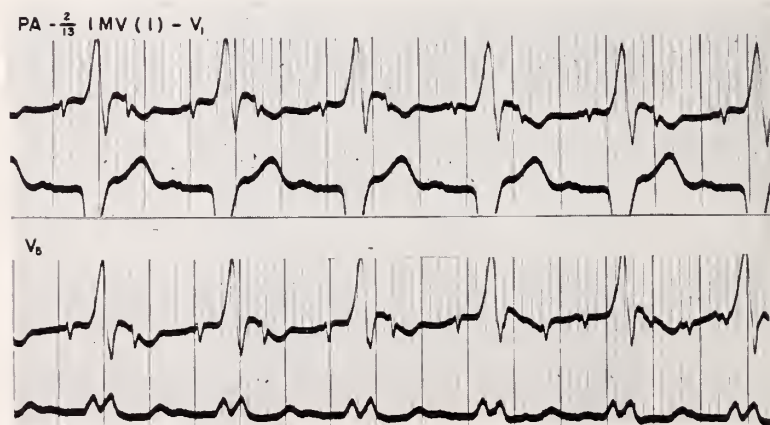


FIG. 14. With the intracardiac electrode in the pulmonary artery, marked acceleration of the atrial rate occurred.

cardiac catheterization, atrial complexes were well demonstrated in leads taken from the pulmonary arteries and right atrium. While potentials were being recorded from the main pulmonary artery, acceleration of the atrial ectopic pacemaker was noted (fig. 14). First the rate was almost doubled and regular. Subsequently further acceleration was noted, with increasing irregularity of the P-P intervals (fig. 15A). After intravenous injections of 0.5 gm. of quinidine lactate,¹ the atrial rate slowed considerably. Thus, atrial tachycardia, flutter and fibrillation were observed in the same patient. Since synchronously recorded chest leads V_1 and V_5 failed to reveal any atrial complexes clearly, neither the nature of the predominant ectopic mechanism nor the changes encountered during catheterization could have been diagnosed.

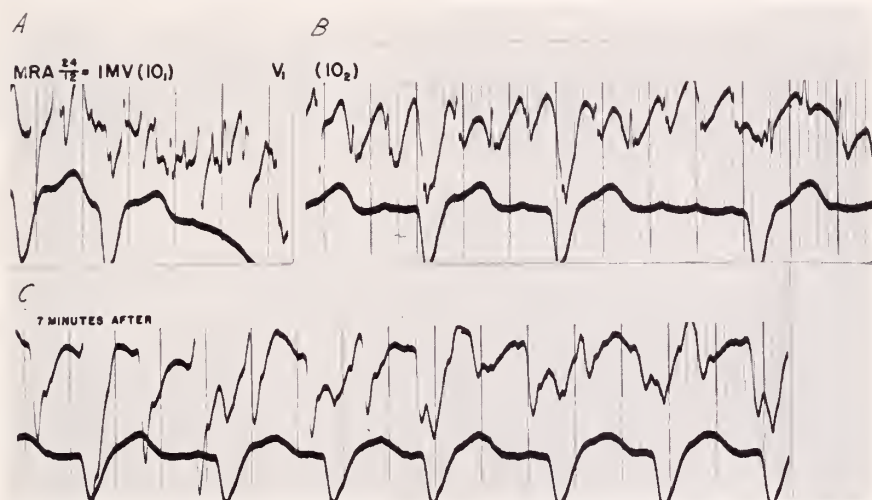


FIG. 15 A: Atrial activity of very high rate (atrial fibrillation). B: Two minutes after the onset of a slow intravenous injection of 0.5 gm. of quinidine lactate (Ely Lilly), the atrial rhythm became regular and slower (400 beats per minute). C: Seven minutes after the injection, the atrial rate had slowed to 250 beats per minute.

SUMMARY

The value of esophageal and intracardiac leads for the analysis of complicated arrhythmias has been discussed. The demonstration of atrial complexes, of such paramount importance to the correct diagnosis, is occasionally possible only with the aid of these advanced techniques. At times, intracardiac leads alone will be of assistance where even esophageal leads failed to demonstrate the nature of an arrhythmia.

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¹ Courtesy of Eli Lilly and Company.

EVALUATION OF DICUMAROL THERAPY IN 287 CASES OF ACUTE MYOCARDIAL INFARCTION*

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The value of anticoagulant therapy in acute myocardial infarction has been the subject of many investigations (1-15) in the past few years. Additional statistically significant data are needed to establish more firmly the efficacy of anticoagulant therapy in this disease. The present report is a summary of clinical studies of the effects of dicumarol on the morbidity and mortality in ward patients admitted to the Mount Sinai Hospital with the diagnosis of acute myocardial infarction. The study period embraces three and one-half years, from January 1947 to June 1950. Data derived from post-mortem studies will be presented in a subsequent report.

METHOD AND MATERIAL

Patients with the diagnosis of coronary thrombosis or acute myocardial infarction were admitted alternately to the two medical services of the hospital. The criteria for the diagnosis and admissability of patients were uniform. Those admitted to one service were given dicumarol routinely, while those sent to the other service constituted a control series. Other than the employment of dicumarol in the first group, therapy was generally similar in both. The duration of bed rest, the type of diet, the use of morphine and sedatives, and the indications for administration of oxygen, mercurials and digitalis were similar in the dicumarol-treated and the control series. To the patients in the first group, 300 mgm. of dicumarol were given orally on the day of admission, and 200 mg on the following day. The prothrombin time, employing the Quick method with undiluted whole plasma, was determined daily and these values served as a guide for subsequent doses of dicumarol. The objective was maintenance of the prothrombin time at a level between two and two and one-half times the control, i.e. 25 to 30 seconds. Dicumarol was continued until the patient became ambulatory which was, on the average, five weeks.

In all, 332 patients with the diagnosis of coronary thrombosis or acute myocardial infarction were studied. Of these, 45 were omitted from analysis. Thirty-seven of this latter group succumbed within 24 hours, too brief a period to permit any effect of administered anticoagulant. The two medical services had an almost equal number of these moribund cases, 18 in one service and 19 in the other. In the remaining 8 cases, associated disease was so marked as to prevent evaluation of results. These included widespread carcinoma, uremia, acute cholecystitis and insulin shock (table I). There then remained 287 cases of uncomplicated myocardial infarction who survived the first hospital day; 142 in the dicumarol group and 145 in the control series.

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ANALYSIS OF DATA

When the two groups are compared as to age, sex, previous myocardial infarctions, severity of illness, duration of illness before hospitalization and the frequency of the use of digitalis, differences are found which statistically are insignificant at the 5 per cent level of probability (table II). The average age of

TABLE I
Distribution of 332 Cases of Myocardial Infarction Between Two Services

	DICUMAROL SERVICE	CONTROL SERVICE
Myocardial infarction with death in the first 24 hours.....	18	19
Myocardial infarction complicated by other serious disease:		
Carcinoma, widespread.....	0	4
Uremia.....	1	1
Cholecystitis.....	0	1
Insulin shock.....	0	1
Myocardial infarction, uncomplicated, surviving the first day.....	142	145
Totals.....	161	171

TABLE II
Two Hundred and Eighty-seven Cases of Acute Myocardial Infarction Surviving More than 24 Hours. Comparison of Dicumarol-Treated and Control Groups

	DICUMAROL TREATED	CONTROL
Number of cases.....	142	145
Age range.....	29-80 years	36-88 years
Mean age.....	57 years	61 years
Sex distribution:		
Male.....	68 per cent	68 per cent
Female.....	32 per cent	32 per cent
Previous myocardial infarction.....	23 per cent	22 per cent
Illness, "severe" at onset.....	35 per cent	41 per cent
Mean number of days before hospitalization.....	2.9	3.3
Digitalization.....	33 per cent	42 per cent

the dicumarolized group was 57 years, that of the control series 61 years. Both groups comprised 68 per cent males. Of the patients receiving dicumarol, 23 per cent had suffered previous myocardial infarctions, while in the control series 22 per cent gave such a history. Those classified as most severely ill on admission constituted 35 per cent of the dicumarol group and 41 per cent of the control series. The mean number of days from the estimated time of infarction to the day of hospitalization was 2.9 in the treated and 3.3 in the control group. Digitalis was administered to 33 per cent of the dicumarolized patients and to 42 per cent of the control series.

Table III indicates the mortality rates for the two groups. In the dicumarol-treated group there were 18 deaths, a mortality of 13 per cent; in the control series, there were 38 deaths, a 27 per cent mortality. This difference is statistically significant at the one per cent level, the probability (P) being less than 0.01.

In table IV, the relative incidences of thrombo-embolic complications are shown. Among the control cases, complications occurred to the extent of 26 per cent, while in the dicumarolized group the corresponding incidence was 14 per cent. This difference again is statistically significant at the one per cent level, the probability (P) being 0.01.

TABLE III
Comparison of the Death Rates in Treated and Control Groups

	MORTALITY RATES		
	Cases	Deaths	% Deaths
Dicumarol treated	142	18	13
Control	145	38	27

TABLE IV
Comparison of the Incidence of Thrombo-embolic Complications in the Treated and Control Groups

	CASES	COMPLICATIONS	% COMPLICATIONS
Treated	142	20	14
Control	145	38	26

TABLE V
Comparison of Thrombo-embolic Complications Followed by Death within 48 Hours, in Treated and Control Groups

	CASES	DEATHS	% DEATHS
Treated	142	5	4
Control	145	15	10

In table V, thrombo-embolic complications, followed by death within 48 hours, are noted. On clinical grounds, these were considered to have been probable immediate causes of death. Among the control cases, death was preceded by one or more clinically recognizable thrombo-embolic complications in 10 per cent; among the treated cases, there was such a sequence in only 4 per cent. In this instance, the probability (P) is 0.024, making the difference significant at the 5 per cent level but not at the one per cent level.

Table VI indicates the type and location of thrombo-embolic complications. There was a marked decrease in the number of pulmonary and cerebral emboli among the dicumarolized cases, totalling 9 in the treated, and 29 in the control series. On the other hand, phlebitis occurred with nearly equal frequency in the

two groups. Subsequent coronary thrombosis occurred more frequently in the treated series, 8 instances in the treated, and only 5 in the control group.

Table VII divides all of the cases into age groups with indications of the number of deaths in each subgroup. It is evident that while the two groups showed largely similar age distribution, the death rate in each subgroup was lower among the dicumarolized patients.

TABLE VI
Types and Locations of Thrombo-embolic Complications

	TREATED	CONTROL
Pulmonary emboli.....	8	21
Cerebral emboli.....	1	8
Phlebitis.....	3	4
Subsequent myocardial infarction.....	8	5

TABLE VII
Comparison of Deaths by Age Groups in the Treated and Control Series

	TREATED			CONTROL		
	Cases	Deaths	% Deaths	Cases	Deaths	% Deaths
Under 46.....	16	2	13	8	2	25
46-55.....	44	4	9	37	8	22
56-65.....	50	3	6	56	11	20
Over 65.....	32	9	28	44	16	36

TABLE VIII
Comparison by Age of Thrombo-embolic Complications in the Treated and Control Groups

	TREATED			CONTROL		
	Cases	Complications	% Complications	Cases	Complications	% Complications
Under 46.....	16	3	19	8	3	38
46-55.....	44	3	7	37	8	22
56-65.....	50	5	10	56	9	16
Over 65.....	32	8	25	44	11	25

In table VIII the thrombo-embolic complications are subdivided into the same age groups. Here, it will be seen that the greatest difference in thrombo-embolic complications occurred in the age group 46-55.

Table IX shows the distribution of deaths according to the week of illness. In both the treated and the control series, the great majority of fatalities occurred by the end of the second week; 92 per cent for the treated and 72 per cent for the control group.

Table X treats thrombo-embolic complications in a similar fashion, by division into week of illness. Here, too, the majority of complications appeared

by the end of the second week; 65 per cent for the treated and 50 per cent for the control series.

Table XI lists the complications attributable to dicumarol. There were four instances of slight rectal bleeding and one instance of gross hematuria. One man, aged 66, died suddenly in heart failure. There was no post-mortem examination,

TABLE IX

Comparison of Deaths by Week of Illness in the Treated and Control Series

(Per cent equals number of Deaths Divided by Number of Survivors from Previous Week)

	TREATED	%	CONTROL	%
1st week.....	11	8	22	15
2nd week.....	6	3	8	6
3rd week.....	0	0	4	4
4th week.....	0	0	1	1
5th week.....	0	0	0	0
6th week.....	1	1	3	3

TABLE X

Comparison of Thrombo-embolic Complications by Week of Illness in the Treated and Control Groups

	TREATED	CONTROL
1st week.....	7	9
2nd week.....	6	9
3rd week.....	1	7
4th week.....	2	8
5th week.....	1	1
6th week.....	3	2

TABLE XI

Hemorrhagic Complications of Dicumarol Therapy

	CASES	%
Hemorrhage due to therapy.....	8	6
Death due to hemorrhage.....	1	less than 1

but since the prothrombin time on the day of death was 76 seconds, with a control reading of 12 seconds, we have preferred to assign this as a probable dicumarol death.

DISCUSSION

The use of the anticoagulant dicumarol in myocardial infarction is directed chiefly against the development of intracardiac thrombi, the source of emboli to the extremities and the viscera, notably the brain. The relative frequency with which thrombosis occurs on the endocardium of infarcted muscle depends upon the extent and depth of the infarcted area. One large series of acute myocardial

infarctions showed, at autopsy, an incidence of 41% of mural thrombi (16). It is essential that, in a study which seeks to determine the effectiveness of dicumarol, the material should include only instances of significant myocardial infarction, i.e., cases in which clinical and laboratory evidence indicate that a sizable portion of the myocardium has been rendered necrotic by the acute loss of its blood supply. We have tried, more specifically, to exclude cases of coronary thrombosis without myocardial infarction, a small group more readily diagnosed pathologically than clinically. These are the cases in which severe pain is associated with thrombotic closure of a coronary vessel, but in which no infarction ensues, presumably due to the presence of adequate collateral circulation. There is the larger and more important group of cases of coronary insufficiency which often closely resembles coronary thrombosis or myocardial infarction. Among them, one finds incomplete closure of a coronary artery, or altered lumina of arteries due to subintimal hemorrhage and atheromatous plaques, or, finally, instances of relative reduction in coronary blood flow secondary to such factors as shock and acute blood loss. In all of these, the coronary circulation is reduced in variable degrees, affecting certain portions, notably the subendocardium, more than the remainder of the myocardium. The subendocardial layer appears to be more sensitive to reduced oxygen tension and undergoes patchy necrosis. Despite the involvement of the subendocardium, the incidence of mural thrombi in these cases is remarkably low, of such infrequency that, when observed, the thrombi have been related to previous infarction (17).

The following four factors have been considered in arriving at the diagnosis of significant myocardial infarction. 1) An attack of severe chest pain followed by variable signs of shock, associated with a drop in blood pressure and an increase in heart rate. 2) Serial electrocardiograms with progressive changes indicative of recent and significant myocardial necrosis. 3) Increase in erythrocyte sedimentation rate and leukocytosis. 4) The fever curve. Those cases of coronary thrombosis without myocardial infarction were excluded by their failure to show significant electrocardiographic changes. In cases of coronary insufficiency, the electrocardiographic changes are chiefly related to ST depressions, transient or sustained, and to varying T wave alterations, notably in the precordial leads. At times, severe coronary insufficiency without vessel closure is associated with all the classical signs of coronary thrombosis, but in these the ensuing infarction is so extensive as to justify their inclusion in this study.

There are other indications for the use of anticoagulants in coronary thrombosis. Venous thrombosis in acutely ill, bedridden patients is of frequent occurrence and the patient with coronary thrombosis is no exception, particularly since he is kept immobile in the attempt to spare the heart. Pulmonary infarctions, the sequelae of venous thrombosis, may be responsible for death when infarction is massive; multiple pulmonary infarcts can precipitate or aggravate cardiac failure, and so be a determining factor in an unfavorable issue. Thromboembolic lesions as an important cause of death constituted 27%, 43 of the 160 cases, in one reported series (16) and 24.5% in another (18). The analysis shown in table V suggests such a relationship, for we find that clinically recognizable

thrombo-embolic complications preceded death two and one half times more frequently in the control than in the dicumarol-treated group.

Finally, it is important to determine what role dicumarol plays in preventing the propagation of existing thrombi and in the development of new coronary thromboses. In thirteen instances, the diagnosis of secondary coronary thrombosis was made, in view of the sudden recurrence of severe chest pain and the development of new electrocardiographic changes. The dicumarol-treated group accounted for eight of these, the control series for five. This number is too small to permit any deductions, but it is clear that anticoagulation as such did not prevent further thrombus formation. Since subintimal hemorrhage is often the basis upon which thrombosis occurs within the coronary arteries the view has been expressed that anticoagulants might conceivably increase the tendency to hemorrhage beneath the intima, and so favor the process of thrombus formation and closure. These are considerations which remain conjectural in the light of our present inadequate data.

SUMMARY

Two hundred and eighty-seven cases of acute myocardial infarction, among hospitalized patients surviving more than 24 hours, have been studied. Of these, 142 received dicumarol and 145 served as controls. Except for the use of anti-coagulants in the one group, treatment in both groups was essentially the same. The death rate in the dicumarol group was 13 per cent, in the control series, 27 per cent. The incidence of thrombo-embolic complications was 14 per cent in the dicumarolized, and 26 per cent in the control group. In only 4 per cent of the dicumarol-treated cases was death associated with clinically evident thrombo-embolic complications, in comparison with an incidence of 10 per cent in the control group. A marked reduction in the mortality rates in all age groups is seen among those receiving dicumarol. Its administration produced 8 instances of minor hemorrhagic complications and an additional case in which death without apparent hemorrhage may well have been due to the use of the dicumarol.

This study supports the conclusion that acute myocardial infarction should be treated with anticoagulants routinely except when recognized contraindications are present.

Acknowledgement: We wish to express our indebtedness to Dr. Franklin Hollander of the Gastroenterology Research Laboratory at this Hospital for his help with the statistical analysis.

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HODGKIN'S DISEASE OF THE STOMACH*

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In most instances, Hodgkin's disease tends to involve the reticulo-endothelial system, notably the lymph nodes, spleen, bone marrow and liver. Not infrequently, however, other systems may be the sites of disease, and occasionally, the process may be confined to a single organ. The latter may be part of the gastro-intestinal tract, such as the stomach and intestine, or the kidney and any other organ containing lymphoid tissue.

Hodgkin's disease affecting the stomach has been described frequently since Schlagenhauser's (1) first report in 1913, but restriction of the disease to the stomach is a rather rare occurrence. More commonly, gastric localization indicates a general type of visceral involvement with the stomach being only one of the several organs involved. In a recent report from this clinic, Sandick (2) reviewed 29 cases recorded in the literature and added 5 cases. Of the 29 reviewed, 15 were said to have revealed restriction of the disease to the stomach at the time of operation, while only one instance of localization to the stomach was substantiated on post mortem examination. The longest follow-up was 13 years.

In all of Sandick's 5 cases, the pre-operative diagnosis was carcinoma of the stomach, and each was subjected to a subtotal gastrectomy. Perigastric lymph nodes were involved in 4 of the 5 surgical specimens, one of these showing infiltrated nodes in the region of the celiac axis. This patient had recurrence of the abdominal pain and signs of the generalized disease in 5 months. Of the remaining 4 cases: 2 were alive and well at 1½ and 7 years, 1 died 4 months after operation showing evidence of widespread disease, and 1 died 6 years later of other causes and without clinical evidence of recurrence, (no post mortem examination having been obtained).

Since this report, another patient suffering from Hodgkin's disease of the stomach came under observation. In view of the fact that this diagnosis was suspected before operation and because of certain other significant features, the case is considered to merit publication.

CASE REPORT

History: The patient, L. F., M.S.H. #618814, a 45 year old white married woman, was admitted for the second time to The Mount Sinai Hospital. She was apparently in good health until 3 months prior to her admission, when she noted the onset of anorexia, followed by a loss of 20 pounds in weight, fatigability, weakness and dyspnea on exertion. The family physician found her to have an anemia and treated her with liver and iron, but with little effect. Shortly before entering the hospital, she developed intermittent eructation, hiccupping, and occasional mild epigastric pain, associated with daily elevations of temperature to 100-101° F. Except for a hemorrhoidectomy on her first admission in 1944, her past history was devoid of relevant illness.

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Examination: The patient was well developed and well nourished, apparently in no acute distress but obviously anemic. Her temperature was 101° F.; blood pressure, 125 systolic and 65 diastolic; pulse, 80; respirations, 16. No superficial lymph nodes were palpable. Eyes, ears, nose and throat were not remarkable except for minimal cheilosis. The heart and lungs presented no abnormalities. The liver edge was palpable on deep inspiration, but the spleen and kidneys were not felt. No masses could be ascertained. Rectal examination was negative.

Laboratory Data: Hemoglobin, 6.8 Gm., red blood cells, 3.2 M.; white blood cells, 10,000 with 78% polymorphonuclears, of which 42% were Band forms, 18% lymphocytes, 2% eosinophiles and 2% monocytes. Platelets were 210,000 per cu. mm. Sedimentation rate



FIG. 1. Pre-operative upper gastro-intestinal series showing the presence of a large gastric tumor with extension to the lowermost portion of the esophagus.

68 mm per hour. Urine, negative; blood Wassermann, negative. Blood chemistries revealed Blood Urea Nitrogen, 44 mg.%; 75 mg.%; total proteins 5.89 gm.%, with A/G ratio 3.21:2.68. Bilirubin 0.4 mg.%, alkaline phosphatase 7 K.A.U. Total cholesterol, 100 mg.% with 50% esters. Creatinine was 1.1 mg.% and the serum amylase was equal to 20 mg. of glucose. Stool guaiac was 2 plus. Blood culture was negative and blood agglutinations to usual organisms were negative. Gastric analysis showed presence of free acid and a small amount of blood.

Course: The initial clinical impression was carcinoma of the stomach. The early hospital course was characterized by persistent 2 plus and 4 plus stool guaiac and severe microcytic hypochromic anemia that responded slowly to several transfusions, totalling 2000 cc. of whole blood. A chest film revealed no infiltration in either lung. The left leaf of the diaphragm was considerably elevated, with obliteration of the corresponding costophrenic

sinus and with a few small Fleischner lines seen in this region. A large mass in the left upper abdomen pushed the left diaphragm upward. A barium meal examination showed a huge neoplasm occupying the entire upper half of the stomach (fig. 1). The mucosal pattern of the lowermost portion of the esophagus was distorted, suggesting extension. The appearance was suggestive of a lymphoma.

The patient was transferred to the Surgical Service, where further diagnostic procedures were carried out. Esophagoscopy revealed only some thickening on the left side of the cardia. Biopsy at this point revealed fragments of esophageal and cardiac mucosa showing a pleomorphic cellular infiltration which was not diagnostic, however. Gastroscopy revealed that the entire cardia and body of the stomach was the seat of an extensive neoplastic process, with small submucosal nodules in the cardia and larger walnut-sized submucosal nodules in the fundus and body of the stomach. These nodules were covered with an edema-

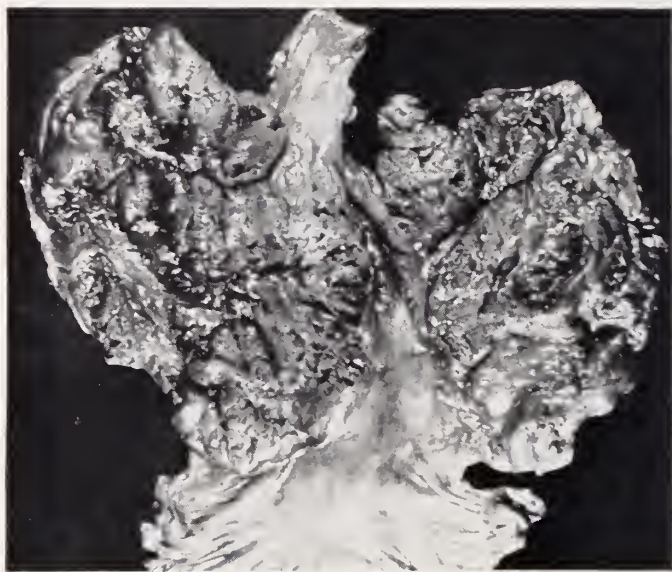


FIG. 2. Post-mortem gastric specimen showing the extent of the tumor process.

tous, friable mucous membrane which was ulcerated in places. The antrum and pylorus appeared normal. The gastroscopist was of the opinion that this picture was compatible with the appearance of a lymphoma.

At exploratory laparotomy, the proximal $\frac{2}{3}$ of the stomach was found to be the seat of an extensive tumor containing multiple, firm nodules (fig. 2). Larger nodules, ranging up to 6 cm. in size, were found along both curvatures of the stomach, and were thought to represent confluent masses of enlarged lymph nodes. There was extensive attachment to the inferior surface of the diaphragm and the posterior parietes, which precluded removal of the tumor. The retroperitoneal, preaortic and peripancreatic node groups did not appear remarkable. The liver and spleen were apparently uninvolved. A biopsy taken from one of the nodules on the lesser curvature of the stomach revealed fragments of malignant tumor tissue, highly suggestive of Hodgkin's disease.

The postoperative course was stormy, and included high fever, a wound infection and partial dehiscence, a severe reactive depression, jaundice, and a progressive anemia. She responded readily to conservative therapy, including antibiotics, and 2000 cc. of whole blood by transfusion. However, on the 25th post-operative day, the patient suddenly developed signs of a massive pleural effusion on the left side. Two thousand cc. of putrid

fluid were aspirated from the left chest. Despite vigorous therapy and massive doses of chemotherapy, the patient rapidly lapsed into coma and succumbed 5 days later on the 30th postoperative day.

Post Mortem Findings(Aut. #14839) A frank perforation of the cardia of the stomach was found that communicated with a small, walled off subphrenic abscess on the left. Residual empyema on the left (200 cc. of purulent fluid with shaggy purulent exudate) was thought to have originated from the subphrenic collection, although no frank perforation of the diaphragm was found. In addition, bilateral moderately severe pulmonary edema and atelectasis of the left lower lobe were other factors contributing to the patient's demise.

Typical Hodgkin's infiltration was found in the following organs: Liver, spleen, lungs, small intestine, bladder and right Fallopian tube. Along with the enlarged perigastric lymph nodes, the peripancreatic, portal, and mesenteric nodes showed similar infiltration. Histologically, the sections revealed the typical cytology of Hodgkin's disease.

COMMENT

Despite the indefinite biopsy findings, the correct diagnosis, as found at post mortem, was strongly suspected in this case before operation. Since Hodgkin's disease was a diagnostic possibility, the question of surgery as against radiotherapy was given serious thought. In the absence of a confirmatory biopsy report, it was felt that it would be unfair to the patient if an exploration were not carried out. Had this been a carcinoma, the patient would have lost an opportunity for early definitive surgery and radiotherapy might have made later operative approach hazardous. If the lesion were lymphomatous, as it later turned out to be, and unicentric in origin, it was felt that a resection of the tumor might result in a better chance for survival.

This case also serves to illustrate again the extreme rarity of isolated Hodgkin's disease of the stomach, since in this instance, although the clinical and radiographic features were those of the disease of the stomach alone, extensive involvement of all abdominal organs was present as shown by autopsy studies. The findings in the left pleural cavity were assumed to have been due to extension of the disease process from the left upper abdomen.

SUMMARY

A case of Hodgkin's disease with the clinical features pointing to a primary affection of the stomach is presented. The clinical course and post mortem findings in this case serve to emphasize the fact that Hodgkin's disease localized only to the stomach is a rarity and points to the fact that most commonly the stomach may present the first symptoms of a more generalized visceral involvement.

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INTESTINAL OBSTRUCTION SECONDARY TO DIAPHRAGMATIC HERNIA

CASE REPORT*

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The association of diaphragmatic hernia with intestinal obstruction due to strangulation has long been recognized and has been reported frequently. Some cases are congenital but most instances of true diaphragmatic hernia are trau-



FIG. 1. Markedly distended colon indicative of large bowel obstruction.

matic in origin usually following stab wounds or gun shot wounds of the chest or direct severe trauma to the chest wall, as in "steering wheel" injuries. These hernias occur most commonly on the left side and only rarely on the right side

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of the diaphragm, probably due to the protection afforded by the large right lobe of the liver. The hernia may evidence itself some time after the accident and then only when an extra exertion produces weakening of the scar of the previous injury.

The mode of causation of intestinal obstruction is by protrusion of a loop of bowel through the rent in the diaphragm and by trapping of this bowel as a "knuckle" in an aperture which is too small to permit of its spontaneous return into the abdomen. When the stomach is the herniated organ, considerable epi-



FIG. 2. Massive left pleural effusion with displacement of the heart to the right.

gastric distress and pain may be present. When the small or large bowel is involved in the hernia, intestinal obstruction with the picture of pain, vomiting and obstipation will be manifested. When strangulation of any of these viscera occurs as part of the process of intestinal obstruction, irritating gastric juice or even bowel content may find its way into the pleural cavity producing a pleural effusion.

It is the purpose of this report to describe a case of traumatic diaphragmatic hernia associated with intestinal obstruction severe enough to warrant emergency cecostomy and in which the finding of a pleural effusion helped to clarify the picture so that the patient could be treated by diaphragmatic repair with resultant cure.

History: O. R. (admission #615538), a Puerto Rican woman aged 36 years, a domestic, was admitted to this hospital on August 29, 1950 complaining of abdominal pain, nausea and anorexia. Seven days earlier she suddenly experienced left lower quadrant pain associated with distension and inability to have a bowel movement. The pain persisted for one week and gradually increased in severity. There had been no other similar previous episodes, nor had there been a recent fall or trauma to the chest or abdomen. However, several years before, she had been beaten and kicked in the abdomen on one or two occasions.



FIG. 3. Barium enema showing herniation of the colon into the thoracic cavity with incarceration of the splenic flexure.

Examination: The patient was a well developed obese woman, acutely ill and in severe respiratory distress. There were diminished to absent breath sounds over the left base with flatness to percussion. The abdomen was markedly distended, and borborygmi were heard. There was left lower quadrant tenderness with rebound tenderness and spasm. The rectum contained no stool or masses.

Laboratory Data: Hemoglobin, 15 Gm.; white blood cells, 13,600; segmented polymorphonuclears, 71; non-segmented, 5; lymphocytes, 17; eosinophiles, 2; basophiles, 1; monocytes, 4. Urine analysis: acid reaction: specific gravity 1.034; albumin, 2 plus; sugar, negative; acetone, negative; two to four white blood cells per high power field. Blood chemistry:

urea nitrogen, 12.0 mg per cent; sodium, 135 meq/l; potassium, 5.0 meq/l; CO_2 combining power, 53.5 volumes per cent.

X-ray Studies: Flat plate of the abdomen showed greatly dilated large bowel (fig. 1). Chest, there was an almost complete obliteration of the left lung by a pleural effusion with a shift of the heart to the right, (fig. 2). Barium enema revealed an obstruction at the splenic flexure.

Course: Because of the acute nature of the obstruction and the disturbed pulmonary physiology an exteriorizing cecostomy was done through a right McBurney muscle splitting incision on August 31, 1950. The cecum was thin walled, distended and friable; it was opened the next day and a large open end catheter was inserted. Following this procedure the intestinal obstruction rapidly subsided, but the dyspnea persisted. The diagnosis at this time was felt to be a neoplasm of the splenic flexure with metastasis to the left lung, or a sympathetic pleural effusion, although diaphragmatic hernia was also considered.

The chest was tapped on several occasions and copious amounts of serosanguinous fluids were removed. Culture of this was negative; cell block showed many lymphocytes. Its protein content was 5.5 Gm. per 100 c.c. The patient obtained great relief from these thoracenteses. Finally a twice repeated barium enema showed a nubbin of bowel protruding through the left diaphragm into the pleural space (fig. 3). Because of the extremely high diaphragm, the splenic flexure had been missed on the first X-ray study.

Operation: This was performed on September 28, 1950 by Dr. P. Klingenstein. After a suitable period of preparation, under endo-tracheal anesthesia, the left chest was explored through the bed of the sixth rib, which was removed, and a loop of splenic flexure of the colon was seen surrounded by a matted mass of fat, all protruding through an opening in the dome of the diaphragm. There was no peritoneal sac found. The circulation of the bowel was not compromised and consequently the intestine was dissected free of the diaphragm and replaced in the peritoneal cavity. The rent in the diaphragm which measured approximately 3 cm. in diameter was closed with two layers of interrupted silk sutures. The patient withstood the procedure well, and made an uneventful recovery. She has been seen in followup clinic and a persistent sinus from the cecostomy was closed in January 1951. At his time she was asymptomatic.

SUMMARY AND COMMENT

A brief description of diaphragmatic hernia is given and a case of traumatic herniation of the splenic flexure of the bowel with subsequent incarceration and intestinal obstruction is presented.

The case demonstrates a not so rare pathological entity to be considered when intestinal obstruction is found in conjunction with pleural fluid. Fortunately, chest aspirations, which ordinarily are not considered dangerous, did no harm here. However, it is conceivable that the chest cavity might have become grossly contaminated if the bowel had been entered by the aspirating needle.

If the knuckle of bowel had been strangulated as well as incarcerated, the decompressing cecostomy might not have sufficed, permitting the colon to go on to necrosis and subsequent empyema of the chest cavity. Happily none of these eventualities occurred, and the patient responded well to the therapy.

PSYCHOANALYSIS AND PSYCHOTHERAPY*

MARK LEWIS GERSTLE, JR., M.D.

There is a conspicuous lack of unanimity concerning the specific meaning of the terms psychoanalysis and psychotherapy. Varying concepts of the laity, medical profession, and psychiatric patients are prevalent, and even psychiatrists themselves are far from clear about their meaning. In a series of contemporary discussions directed at an attempt to differentiate certain aspects of analysis and psychotherapy, about 40 members of The Mount Sinai Hospital's psychiatric staff, most of whom are analysts, expressed many ideas which indicate clearly how diverse and, in most instances, indefinite are the various criteria employed in their attempts to define, delimit, and describe each of these procedures. As an illustration of how basic and widely held such differences of opinion are, psychotherapy has been recently defined in over 40 different ways by a group of psychiatrists in the Group for the Advancement of Psychiatry. In April 1950, Anna Freud in her address at the 60th Anniversary of Clark University dealt with the prevalent misunderstanding between psychoanalysis and academic psychology. She traced these misunderstandings between the two disciplines to matters pertaining to terminology, concepts, and theories. She also stressed the fact that confusion concerning analytic facts and definitions is obviously manifested by the conflicting, contradictory judgments passed on psychoanalysis by academic psychologists. (Anna Freud's views on this matter are well summarized in the May 1951 Bulletin of the American Psychoanalytic Association.)

It can be stated that psychoanalysis seems to differ from psychotherapy at least in one obvious respect. Analysis subserves a dual role; first, it serves as an instrument of research or method of psychiatric investigation, and second, as a recognized form of treatment. In contrast, psychotherapy, as is implicit in the term, is mainly concerned with treatment only, and as such is not used for the purpose of adding to or modifying the body of existing knowledge concerning psychiatry. In line with this point of view, the scope of psychotherapy would seem to be more restricted than that of analysis, yet despite this fact, psychotherapy employing as it does many different techniques is usually thought of as the more flexible form of therapy. This feeling is also reinforced by the fact that the psychotherapist, in contrast to the psychoanalyst, is less passive in the doctor-patient relationship. The psychotherapist, moreover, does not hesitate to use freely and more or less interchangeably (depending to a great extent upon his erudition, particular skills, and personal aptitude) suggestion, persuasion, interpretation, support, encouragement, reality testing, etc. whenever and wherever each of these approaches seems specifically indicated. On the other hand, the psychoanalyst usually feels far more restricted in his choice of tools. This is due to the greater passivity inherent in Freud's basic views regarding the nature of the psychoanalytic process.

* From the Department of Psychiatry, The Mount Sinai Hospital, New York. Read before a Psychiatric Conference, The Mount Sinai Hospital, and at the annual meeting of the American Psychiatric Association, Cincinnati, O., May 9, 1951.

Primarily, there would seem to be numerous obvious differences between analysis and psychotherapy. However, in an attempt to evaluate each of these *differences* it becomes clear that it is difficult, if not impossible, in the present state of our thinking to single out any *one* valid *difference*. Whether we consider the way in which the transference situation is handled, whether we stress relative effort expended on elucidating conscious and unconscious material, whether we emphasize the usual greater frequencies of the psychoanalytic sessions, or the total length of time required for a thorough analysis, or the length of each individual session between doctor and patient does not matter essentially. Psychotherapy can and frequently does embrace some or all of these conditions; therefore, no single one of them can by itself be regarded as a valid criterion or of pathognomonic significance, since the almost universally accepted dynamic concept in psychiatry has swept the mere descriptive and symptomatic emphasis into the background, replacing them with the more truly etiological concepts which have so immeasurably added to our understanding of human behavior.

There lingers, however, a prevalent feeling that psychoanalysis represents a more complete and more searching method of treatment and that psychoanalysis must therefore be thought of as a specialty within a specialty. For this reason, in our experience, most laymen, which of course includes almost all psychiatric patients, have the idea that psychotherapy represents some sort of a substitute or compromise, something which falls considerably short of "the works". What I am attempting to clarify is whether or not this opinion is true. Is it actually the case that psychoanalysis is complete therapy and psychotherapy partial therapy, and is the one, therefore, deeper and the other usually more superficial? Is it proper for us to subscribe to the frequently expressed thought that anything that transpires between an analyst and his patient can be properly considered psychoanalysis, regardless of whether or not the orthodox analytic setting prevails? On the other hand, can even the analytically sympathetic and oriented psychotherapist entirely free himself from restrictions imposed upon him because of his relative lack of analytic training particularly in view of the fact that he himself has, often, not had a personal analysis. Is the analyst analogous to the master mathematician who, because of the universality of his knowledge, can use interchangeably, depending on the specific requirements of a given problem, arithmetic, algebra, geometry, calculus and trigonometry?

At this point it seems relevant to question, in an attempt to define criteria whether only an analyst is fully capable of furnishing such information or elaborating such data, or is the psychotherapist, presuming he is himself unanalyzed, less well equipped to deal with counter-transference phenomena on a conscious level.

In a solicited criticism of this paper by an impersonal analyst, it was remarked that "its contents are so formulated as to reflect a persistent struggle to resolve an inner doubt, and that the casual reader would likely be aware that the author is a non-analyzed psychiatrist struggling with his conscience as to where he must limit his range of therapeutic activities". The author's colleague is exactly right, but it is felt that since there are hundreds of non-analyzed psychiatrists, the

writer's attitudes and questions may have a general significance rather than merely representing a personal problem. Hence, the attempt is made to make this paper genuinely objective.

This attempt to establish valid criteria is fraught with difficulties which must always be inherent in any such task. The writer recalls that in an undergraduate course in biology he was struck by the amazing difficulty encountered when one attempts to distinguish accurately between living and non-living things. On the surface the problem does not seem very real since the most casual observer is keenly aware of the obvious differences, let us say, between a stone and a man. Yet, when one attempts to get away from *descriptive differences* and tries to single out any specific difference as crucial, the real complexity of the situation appears for the first time. Locomotion, metabolic activity, senescence, reproductive ability, for instance, are all phenomena which one inevitably associates with animate objects, yet at the boundary-line between living and non-living things one finds each of these activities present in certain emulsions and oil droplets which are most certainly *not* living things. Thus it can be seen that at the margin dividing these two classes of objects (the realm of physical chemistry) not one distinction actually stands up. The mergence of the one with the other and their mutual impingement reveals the complexity of a problem which merely masquerades as simple.

Another example may be permissible to illuminate further the inevitable difficulties such a comparison entails. Anyone who is not color blind has no difficulty in distinguishing green from red, yet only a physicist can scientifically explain and describe the separate wave lengths of light which constitute their real difference. If we go a step farther and attempt to describe our feelings about the colors red and green, whether or not they please or displease, stimulate or soothe, we are challenged by an even more involved task, and if we then enquire why we feel as we do, we open up paths of investigations which are almost endless. Here again we are forced to recognize that the obvious is often an oversimplification and thus a part truth only.

Thus it is with analysis and psychotherapy. The differences which *appear* to be so real are, upon deeper scrutiny, far less valid. Small wonder, therefore, that the laymen, the general practitioner and the psychiatrist himself is confused when he attempts to set up oversimplified differentiations between psychoanalysis and psychotherapy.

If we presume that the psychoanalyst can do everything that the psychotherapist can do, have we not a right to agree with the previously mentioned hypothesis that analysis is all inclusive and that psychotherapy, therefore, is something less. If this be so, the question immediately arises whether all psychotherapists should not be analytically trained so that they may be completely freed from any restrictions, actual or suspected. It is obvious that even should this be the desirable goal it nevertheless presents many practical difficulties, particularly the larger expenditure of time and money required for analytic status.

Along with such a realistic question there are several others. These

include the *pros* and *cons* of the lay analyst or psychologist as independent therapists, as well as the more general consideration of what kind of therapist is best fitted to care for psychotics and patients with organic brain disease who certainly are not usually thought of as appropriate candidates for analysis. Might there not also be a real risk that if all psychiatrists were to be analytically trained and qualified, that their disciplines in general medicine might have to be shortened, and that this would result in an unfortunate widening of the already existing gap between psychiatry and the rest of medicine.

It has been wisely said that the insights of psychoanalysis far transcend its therapeutic efficiency. On the other hand it seems completely axiomatic and universally agreed that Freud's basic analytic contributions have furnished psychiatry with indispensable and invaluable truths. Every psychiatric aspirant, whether or not he seeks analytic qualification, must be trained in the fundamentals of psychodynamics, most of which rest securely on the roots planted in analytically fertilized soil. Actually more and more young men going into psychiatry *are* seeking analytic training and qualification despite the larger expenditure of time and money. The question is, however, should this goal eventually be made mandatory so that some day, for instance, only qualified analysts may be eligible for certification as psychiatric specialists.

Until some or all of these points are settled it is not heresy to state that the erudite and talented therapist, be he analyst or not, will continue to employ as much flexibility and versatility as his virtuosity and temperament can bring to bear upon every specific therapeutic problem. The personality of the psychiatrist even more than his technique and academic accomplishments are always of the greatest importance in meeting to the fullest extent the needs of his patient. From the first visit to the last the therapist must try to be fully conscious and aware of what is going on not only within his patient but also within himself. Concerning this essential, there can be no legitimate difference of opinion.

Uncritical acceptance, accurately timed interpretative efforts, efforts directed to giving a patient various levels of insight, permissiveness and coercion must at different times, in different settings, and in widely fluctuating degrees be mobilized without prejudice, spurious preconceptions, or arbitrarily imposed restrictions. Granted competence, enthusiasm, intellectual integrity, in addition to the highest Hippocratic motivation, no psychiatrist is apt to overstep the boundaries of what he honestly feels to be his own limitations. Until the relative positions of psychoanalysis and psychotherapy are more clearly defined the best interests of the patient will continue to be subserved by the competent psychiatrist, no matter what his particular disciplines may be. And since the patient's welfare is incomparably the most important objective, all other considerations must at this time be considered inconsequential, no matter how great their theoretical importance may be.

ABSTRACTS

AUTHORS' ABSTRACTS OF PAPERS PUBLISHED ELSEWHERE BY MEMBERS OF THE MOUNT SINAI HOSPITAL STAFF

Members of the hospital staff and the out patient department of the Mount Sinai Hospital are invited to submit for publication in this column brief abstracts of their articles appearing in other journals.

Pancreatic Achylia and Glycosuria due to Cystic Disease of the Pancreas in a 9 year old Child.

H. ANFANGER, M. H. BASS, R. HEAVENRICH, AND J. J. BOOKMAN. J. Pediat., 35: 151, August, 1949.

The case of a 9-year-old, previously healthy boy is described; he developed intestinal obstruction and at operation presented an abdominal mass, which on separate biopsies proved to be pancreas studded with multiple small cysts. Microscopic examination revealed a different lesion from that seen in congenital cystic fibrosis of the pancreas, but closely resembling that found in polycystic disease as described by Lindau. Extreme emaciation and evidence of vitamin A deficiency were present. These were accompanied by pancreatic achylia, failure to absorb vitamin A, flat gelatin tolerance test, and the presence of glycosuria. Clinical, chemical, and metabolic studies of the case are reported. In a follow-up after one year, the patient's general condition is good although his height and weight are retarded and he is prone to develop upper respiratory infections with rapid loss of weight. His mild glycosuria persists. Cystic disease of the pancreas and tests for pancreatic function are discussed.

Cushing's Syndrome Due to Tumor of Adrenal Cortex. H. M. GOLDSTEIN. Am. J. Dis. Children, 78: 260, August, 1949.

A case of Cushing's syndrome in a 11 month old infant with onset at 3 months with apparent surgical cure following the removal of a tumor of the right adrenal cortex is described. This syndrome is differentiated from the adrenogenital syndrome because of varied symptomatology, therapy, course and prognosis. Differential diagnosis is discussed. The diagnostic importance of determination of the urinary excretion of 17-ketosteroids and of special roentgenographic methods is emphasized. A pre- and post-operative regimen of hormone and fluid therapy is outlined for the management of such cases.

Furfuryl Trimethyl Ammonium Iodide (FTAI) For Postoperative Urinary Retention. M. A.

GOLDBERGER, R. LANDESMAN, AND J. B. BURKE. Am. J. Obst. & Gynec., 58: 376, August, 1949.

Urinary retention and difficulty in initiating micturition have been frequent complications following abdominal and vaginal operations. Furfuryl trimethyl ammonium iodide (FTAI) commercially known as Furmethide, a parasympathomimetic drug was used in a series of 100 cases on the gynecological service of the Mt. Sinai Hospital. This drug has been of value in initiating micturition particularly in postoperative cases that involve the anterior vaginal wall and the urethrovesical neck. The use of FTAI orally in doses of 10 mgs. 3 times a day is an adjuvant in the prevention of urinary retention following gynecological surgery. No serious toxic effects were observed.

Ileocejeunitis. B. B. CROHN. New York State J. Med., 49: 1808, August, 1949.

This paper covers 38 cases of ileocejeunitis, 27 men and 11 women, a ratio of almost 3 to 1. The disease is a granulomatous infiltration of the jejunum. The inflammatory lesion should be considered under 4 anatomic and pathologic variations which constitute its form of invasion in the upper alimentary tract: (1) as a progressive invasion upward from an older

regional ileitis; (2) as a diffuse primary granulomatous infiltration of the entire ileum and jejunum (rarely duodenum); (3) as a localized involvement of an isolated area of jejunum, and (4) as a combined lesion involving upper jejunum and lower ileum, the 2 processes being entirely discontinuous. The isolated jejunitis are the most interesting since they are susceptible to resection with good late results. An acute inflammatory jejunitis is quite different and much more serious. The internal fistulae are less common than in regional jejunitis, though they appear in abscess formation. Intestinal obstruction does not often occur. Secondary anemia and nutritional disturbances are common.

Allesthesia and Disturbance of the Body Scheme. M. B. BENDER, M. F. SHAPIRO, AND H.-L. TEUBER. Arch. Neurol. & Psychiat., 62: 235, August, 1949.

In a case of diffuse encephalopathy, the outstanding symptom was allesthesia, or consistent erroneous referral of sensations from one side of the body to the other. Cutaneous, auditory and visual stimuli impinging upon the patient's right side were localized by him to approximately homologous areas on the left. There were associated motor and intellectual disturbances suggesting an "organic mental syndrome" in which changes in the body scheme and inability to deal with spatial relations formed the principal features. It is pointed out that this patient's behavior, and responses, as in so many other cases usually considered "deteriorated" or "confused" are not really so, but demonstrate patterning and organization and are predictable. The theoretic importance of disturbance of the integrity of the body image in problems of spatial orientation is discussed.

After-Imagery in Defective Fields of Vision. M. B. BENDER AND R. L. KAHN. J. Neurol., Neurosurg., & Psychiat., 12: 196, August, 1949.

A study is presented on the nature of after-image alterations in a patient with irregular but homonymous defects in the fields of vision following lesions in both occipital lobes. The test patterns used were simple geometric figures which were varied systematically. It was observed that under certain conditions there was an increase in the extent of the figure in the after-image over that in the perceived field (completion effects). The size and configuration of the stimulus figure, as well as the presence of a surrounding field of stimulation, are some of the many factors which alter the visual after-image and lead to completion. Consistent changes in latency, intensity and duration could be shown in homonymous parts of the after-image field, whereas the corresponding regions in the perceived field show no defects. While visual after-imagery can thus be used as another method of demonstrating defects in fields of vision, due to the completion effect, it cannot be substituted for perimetric or any other method of testing vision.

Tetany in Newborn Twins Coincident with Maternal Toxemia. H. LUBENSTEIN. J. Pediat., 35: 210, August, 1949.

Hypocalcemic tetany in binovular twins of a mother with toxemia of pregnancy is reported. Attention is directed toward the mounting significance of this condition and its differentiation from cerebral hemorrhage. There is also illustrated the need for prolonged calcium therapy. The question of the etiology is evaluated, since it is only logical to probe for the cause of an entity affecting binovular twins in the mother. Among the factors principally analyzed were the meagre intake of milk in her prenatal diet, and the toxemia of pregnancy which existed at parturition. Evidence is presented, including a review of other hospital cases, for a possible etiological relationship between maternal toxemia of pregnancy and tetany of the newborn infant.

Colonic and Proctologic Diseases. R. TURELL AND A. S. LYONS. Surg. Gynec. & Obst., 89: 105, August, 1949.

In this paper the pertinent literature dealing with colonic and rectal anatomy, physiopathology and disease is reviewed. The review is based on the perusal of over 900 articles that appear in the preceding 2 years.

Alloxan Subdiabetes in Rabbits Detected by Modification of Glucose Tolerance by Adrenal Cortex Extract. H. ZUCKER. Proc. Soc. Exper. Biol. & Med., 71: 597, August, 1949.

The intravenous glucose tolerance of rabbits was studied before and after the injection of one or two small doses (less than 40 mg/Kg) of alloxan. The rabbits showed no significant modification of glucose tolerance after alloxan treatment. In untreated animals the injection of 0.5 cc. of adrenal cortex extract/100 Gm bodyweight one half hour before the glucose injection failed to modify the tolerance test. After alloxan, pretreatment with adrenal cortex extract was followed by a significant impairment of glucose tolerance; by definition these alloxan treated animals were subdiabetic. The subdiabetic state persisted for the duration of the experiment (up to 15 weeks).

Clonorchiasis in the United States. Report of Four Cases. M. H. EDELMAN AND C. L. SPINGARN. J. A. M. A., 140: 1147, August, 1949.

The authors report the detection of 4 cases of infection with the trematode, *Clonorchis sinensis*, in Caucasians who had come to the United States after residing in Shanghai, China. These are the first cases of this disease in the white race reported in this country. *Clonorchiasis* is encountered in China, Japan, Korea, Formosa and French Indo-China. The infection involves primarily the biliary passages of man who become infected by ingesting parasitized, uncooked or incompletely cooked fresh water fish. The diagnosis is verified by finding the characteristic ova in the stool or duodenal fluid. Known methods of treatment have been unsatisfactory.

A Clinical Evaluation of Ethinyl Estradiol in the Menopause. H. DUBROW, C. S. POOLE, AND R. I. WALTER. New York State J. Med., 49: 1828, August, 1949.

Ethinyl estradiol is a potent, orally active estrogen, combining a high therapeutic efficiency with a low incidence of toxic symptoms. In a series of 34 menopausal patients, (19 in natural menopause, 13 surgical castrates and 2 x-ray castrates), treated with ethinyl estradiol, there was complete relief of symptoms in 29, moderate relief in 4 and one failure. The average maintenance dosage was determined as 0.05 mg. daily and with this no toxic symptoms occurred.

A Psychosomatic Unit in a General Hospital. S. S. BERNSTEIN, S. M. SMALL, AND M. J. REICH. Am. J. Nursing, 49: 516, August, 1949.

The psychosomatic unit at the Mount Sinai Hospital is largely concerned with the treatment of patients afflicted with diseases now generally recognized as psychosomatic, i.e. precipitated or conditioned by emotional factors, chiefly of a chronic or persistent nature. The unit serves as an educational center for the orientation of medical, nursing, and other personnel to psychosomatic concepts of illness. The emotional plight of the anxious and fearful hospital patient, obsessed with doubts of his own and his family's security, has hitherto been given scant attention by medical staffs usually preoccupied with a baffling symptom, a bizarre laboratory report, or an elusive diagnosis. The increasing complexity of medical investigation with its countless clinical and laboratory procedures has often consumed the interest and energy of the physician to a point where the patient as a person is ignored. The psychosomatic approach is largely dedicated to a sympathetic understanding of the patient's total personality, as conditioned by his heredity, childhood experiences, environment, and familial relationships, and to understanding how this personality is related to his illness. A painstaking effort to assuage, if not control, distressing economic, familial, and situational factors, is an integral part of the psychosomatic approach. The solution of apparently insoluble problems is often achieved by the intelligent co-operation of the nursing, social-service and medical personnel. An environment in which sympathy, gentleness, patience, and understanding prevail can increase the effectiveness of psychoanalytic and psychotherapeutic measures. The bulk of the patients in the unit are transferred from the general wards upon the recommendation of one of the 6 liaison psychiatrists who bridge the gap between the psychiatric and the other services.

Further Studies on the Use of Streptomycin in the Treatment of Whooping Cough. K. S. SHEPARD, J. L. KOHN, S. R. KAPLAN, AND T. C. ALLEN. *Am. J. Dis. Child.*, 78: 212, August, 1949.

Streptomycin was administered to 64 patients. A large majority of the children were admitted during the first week of the paroxysmal stage. They came from a poor economic background and very few had been given any prophylactic whooping cough vaccine injection. The younger group, consisting of 43 children under 3 years of age, were given streptomycin simultaneously by the aerosol route and by intramuscular injection. In the second group and older group, consisting of 21 children, the streptomycin was administered by aerosol only. In both groups the course of whooping cough was favorably influenced in most of the children, but it was most effective in the children under 1 year of age. There were 32 patients moderately ill on admission and the results were favorable. The results were almost as favorable in those admitted severely ill. However, there seemed to be no advantage in the combined treatment when compared with aerosol alone or intramuscular injection alone. The dosage for the aerosol administration was 50 to 100 mg. of streptomycin 3 times daily for 5 days for the younger group, and a total dose of 1 gram a day for 5 days to the older group. In the youngest children the aerosol was administered under a plastic hood. The dosage for intramuscular injection up to one year was 500 mg. per day divided in 8 doses; up to 3 years, 800 mg. per day; and over 3 years 1 gram per day.

Diaplaental Infection of the Foetus with the Virus of German Measles Despite Immunity of the Mother. B. SCHICK. *Acta paediat.*, 38: 563, 1949.

The usual teaching that mothers immune to German measles do not permit the infection of the fetus is not always correct. One case is published by Warkany. The mother had German measles in childhood. She was pregnant in the second month and took care of her two other children who had German measles. The baby born later showed the typical malformations of a "Rubella child". Similar observations are in smallpox. A mother immune to smallpox (by vaccination or smallpox) should never take care of a smallpox patient. The fetus may be infected. Over 40 cases of the literature are collected. One must differentiate between humoral and cellular immunity. The humoral immunity would protect mother and fetus because the antibodies are present in the blood. The cellular immunity mobilizes the antibodies only after several days. This is sufficient to protect the mother but not sufficient to protect the child.

Criteria for Extraction in Orthodontic Therapy Related to Dentofacial Development. J. A. SALZMANN. *Am. J. Orthodontics*, 35: 8: 584, August, 1949.

The factors in the dentofacial complex which constitute criteria for extraction in individual patients may be summarized as follows:

1. The labiad-linguad dental arch relationship to the prementon point.
2. The size of the gonion angle.
3. The axial inclination and the relationship of the mandibular incisors to a plane which passes through the prementon point and is perpendicular to the mandibular plane.
4. The type and degree of irregularity and crowding present in the dental arches before orthodontic treatment is undertaken.
5. The presence of constriction of the basal arches in relation to the dental arches.
6. The relative difference in size of the basal arches.
7. The amount and distribution of the soft tissues covering the facial bones.

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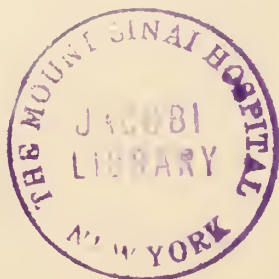
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